American Machinist

A McGraw-Hill Publication. . . Established 1877

New York, August 1, 1929

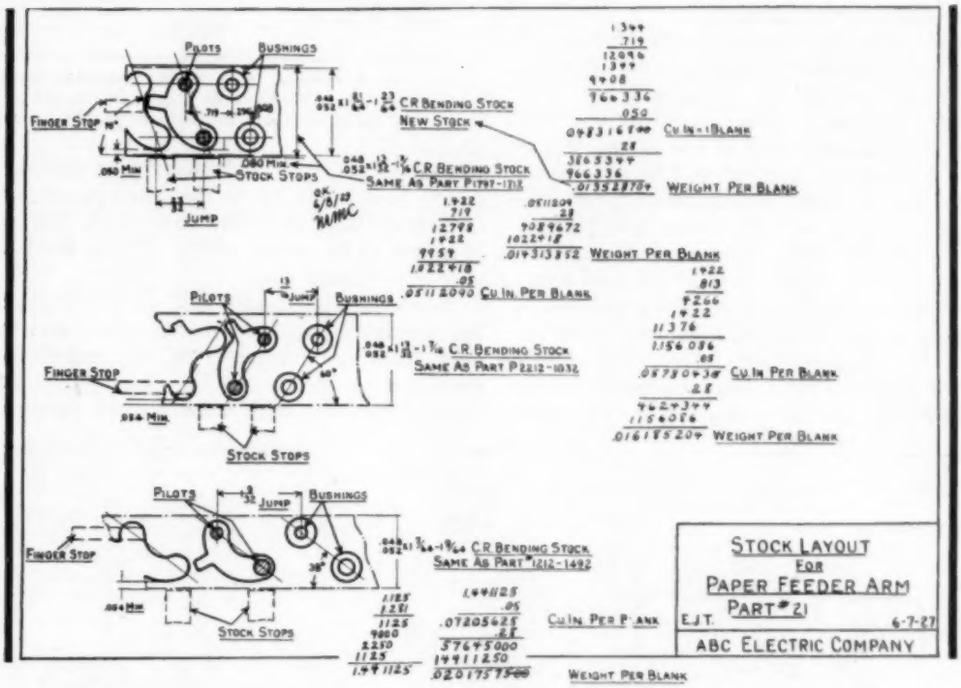


Fig. 1—Typical proposal sheet, showing three proposed blank layouts as submitted by the designer. The one accepted by the supervisor has been initialled

Material Economy

In Sheet-Metal Blanking

By W. H. Malliet

Supervisor of Design and Development, Royal Typewriter Company, Inc.

DESIGN of the die and cost of the sheet-metal stock required become vital considerations with the ever-increasing demand for sheet-metal dies to manufacture parts for various articles to meet the competitive market. Today, sheet metal is blanked and formed in intricate shapes for general use, or to function where castings or forgings were formerly considered essential. Designers are constantly studying and planning to offset increased labor cost with cheaper and more durable sheet-metal construction. Reduction in the raw material cost and in the number of operations is often the means of accomplishing this ultimate purpose. In up-to-date factories manufacturing sheet-metal parts, the old method of having the diemaker lay out his stock and design without a drawing, as well as lay out his templet and construct his die, is a thing of the past. Specialists in each phase of the work handle that particular phase, and the finished die is the result of the work of many men rather than one.

In most plants it is up to the designer to plan for the most economic use of the metal, or "stock," and this must be done before the die is actually designed. A stock layout should be made by the die designer to determine the most economical angle for placing the blank in relation to the lengthwise edges of the stock. To avoid repetition of this work, prints of these diagrams can be bound together in a folio for ready reference in designing future dies and making later stock layouts of a similar nature. The part drawing should be drawn with the plan view of the blank in correct rela-

tion so that the burr edge is up, or if not, the burr-edge side should be designated. If the detail has been drawn to an enlarged scale because of its small size, the part should be sketched full size. The thickness-tolerance and the temper of the stock to be used should be given on the drawing. In establishing these temper and thickness limits, the designer of the part should, of course, be familiar with rolling-mill basic prices for hard and soft materials and also for thickness and width. Sometimes, it is advisable for the die designer to go back to the part designer and have the material specified for the part changed for more economic production.

There are four principal tempers which can be obtained in steel: hard, half-hard, bending, and drawing.

The mill charges an extra price of about a half cent per pound for soft materials. This is because the soft material requires an extra operation of annealing. Likewise, the thinner sections of greater widths cost more per pound than the thicker sections because of difficulties and sometimes extra operations of rolling and gaging. If the design requires 0.039-in. thickness of material. which would bring it in the 0.035- to 0.039-in. mill tolerance price class, it would be cheaper to revise the design arrangement if possible for 0.042-in. thickness, since the cost then would be in the 0.040- to 0.049-in. price classification. For a 6-in. width, soft, cold-rolled steel requirement of 100,000 lb. per year, the saving made would be $150. Hard stock used instead of the soft would save $550. It is the usual practice to allow plus or minus 0.002 in. limit on a stock thickness and plus or minus $\frac{1}{64}$ in. on the width. Closer limits are furnished only at increased cost.

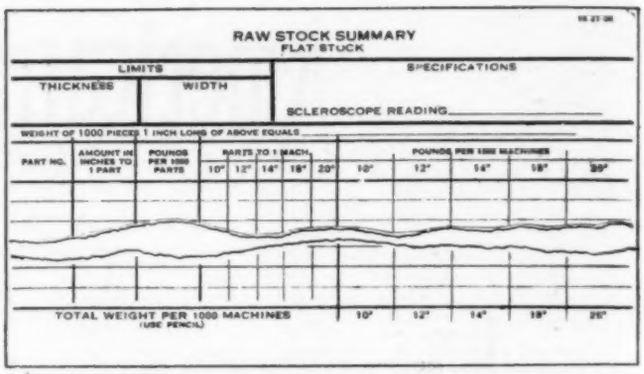


Fig. 3—A sample "Raw Stock Summary Card" for flat stock. Upon these cards is kept the record of the sizes of stock on hand that are available for any job

A good stock layout will show the several ways the blank may be positioned for blanking and the contents in cubic inches, or better still, the weight per piece, for each consideration. In Fig. 1 is shown an example of layout diagrams with stock weight figured.

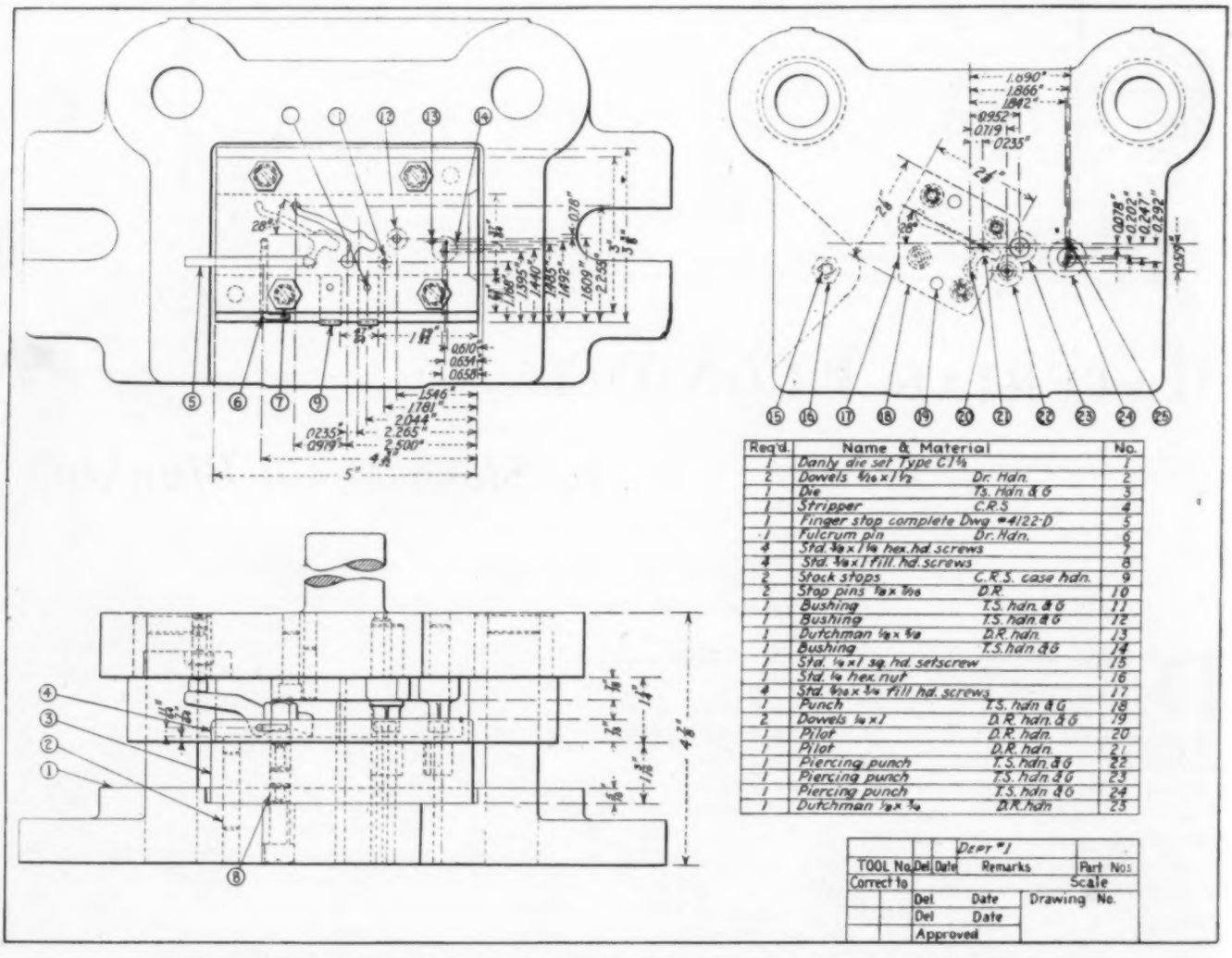


Fig. 2—Typical assembly for a punch and die block, showing the blank setting and the method of dimensioning from one side and one end

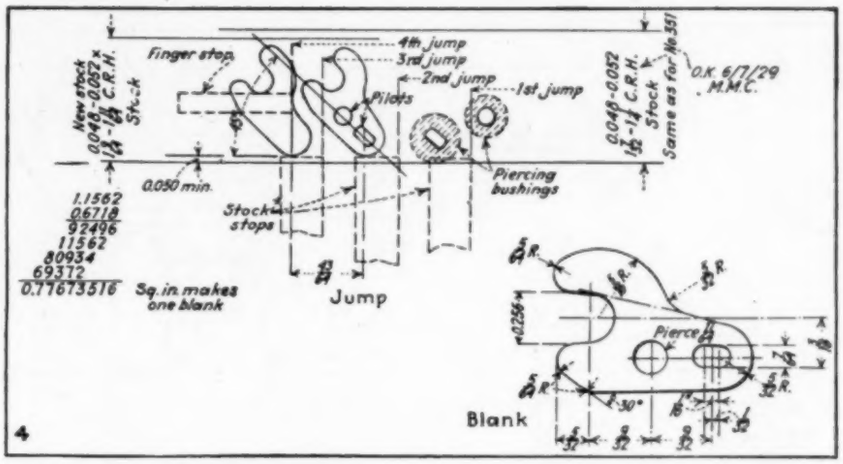


Fig. 4—Blanking layout for a four-jump, plain, follow die

In this illustration, the stock has been laid out to be blanked on an economical angle for a four-jump, plain, follow-die. As indicated by the designating lines, the front end of the stock in starting production is stopped at the first, second, third, and fourth transverse movements for press-stroke operations before the part is completed. The first blank obtained by this layout will be imperfect, and the spacing of the holes will not be correct on the first two, because the pilots do not function in relation until they pick up the third-jump section of the stock.

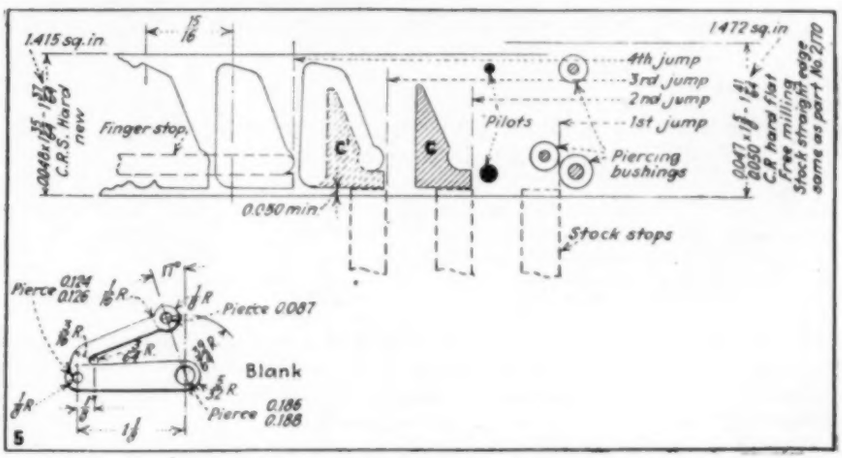


Fig. 5—A layout showing pilot-hole pick-up on second jump

This layout is a good illustration of a four-jump spacing with a pickup of the pilot holes on the second jump. The first blank obtained will be perfect. Shown in section *C* is a trim-out hole position. By means of this hole, the correct shape of the blank is obtained at the fourth jump of the stock without construction of a die with a long slender ledge as shown by sectioned surface *C'*. It is readily seen that such a ledge would crack when hardening the die, or spring, shear, or crack while in operation.

There are a number of ways to make these layouts, and while the diagrams may require several hours to make if the pieces are intricate, they may save considerable money in the cost of material. If the part as laid out will waste $25 per 150,000 pieces, this would amount to $175 in material loss alone during the average life of a die, not to mention the economy of less material to handle all along the line.

One of the quickest and cheapest methods for obtaining positions of the blank in the stock is to use two small pieces and one large piece of thin, transparent paper, and a very soft pencil. The blank is traced with heavy black lines from the full-size sketch on each of the small-sized papers. The small pieces of paper are then arranged and tacked in a desirable position, each center properly spaced for the jump of the stock in blanking. The large-sized paper is used for the diagram of the positions and the two blanks are traced on it after they are placed. In positioning the two small papers, care should be taken to have the proper amount of stock between the blanks. This is to prevent the edge of the blank near the opening in the stock from which a blank has been obtained from rolling in and possibly cracking the thin wall of stock between them when the punch goes through. The accompanying table is given to show allowance that may be used for widths of stock up to 6 inches.

Several different ways of laying out blanks are shown in Figs. 4, 5, 6, 7, and 8. In selecting the desirable angle layout from the available options, several considerations should be given attention. If the blank is to have part of its surface or surfaces bent at a sharp angle on a radius of $\frac{1}{32}$ in. or less, the bends should come across the grain or not more than 30 deg. off of the grain, especially for stock of 0.075-in. thickness or over.

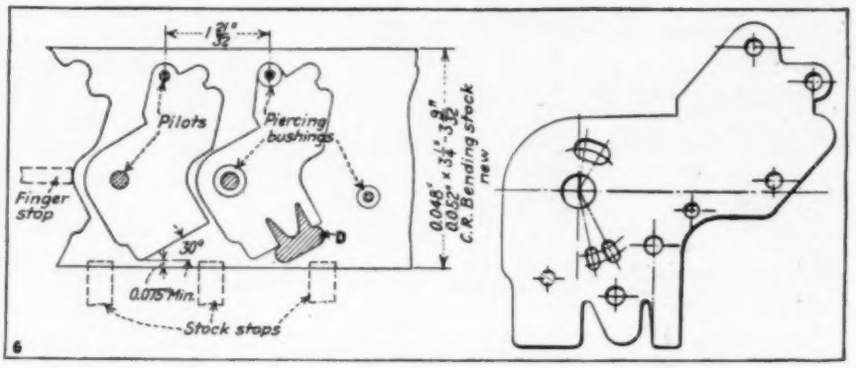
It is the duty of the designer to furnish a drawing giving the plan, front elevation, side elevation, and stock dimensions of the blank required. The parts of the tool must be clearly shown and numbered, but not necessarily dimensioned or detailed on the drawing. All centers that can be bored and the holes to be counterbored are dimensioned from one side and one end. With these dimensions, the die can be roughed out on a precision boring machine to allow the insertion of small tools for milling to the scribed outline of the blank. The dimensions of the centers on the punch holders are also given for boring.

In Fig. 2 is shown a die laid out as described. As illustrated, standard aligning pin-punch and die-holders are being used extensively, and are procurable commercially. They reduce press set-up and tool upkeep costs as they insure correct setting up of the punches in relation to the die when putting the die on the press, thereby eliminating side shearing and the necessary of frequent grinding to keep the die in condition. Stock stops No. 9 on the drawing, Fig. 2, position the stock correctly for obtaining the holes in relation when starting the strip stock. Piercing bushings, shown by details No. 12 and No. 13, are a help to the diemaker in case of error, in altering, in positioning holes, and in working out and lapping small or odd-shaped holes. The replacement of these bushings is cheaper in cases of deep shearing than excessive grinding which will shorten die life.

A spring is attached from the side of finger stop No.

Fig. 6—Proper layout also shows die weaknesses

A stock layout is shown in Fig. 6 for a die to blank and pierce the principal holes. It can be seen by referring to the blank outline that section *D* "trim-out" will eliminate slender projections which otherwise would be in the die at the blank hole. If this section were trimmed out in another set-up operation at the same time that the additional holes were punched, it would not be possible to bush the holes because of their closeness. Such a set-up would require a number of jumps of the stock if the holes were properly bushed.



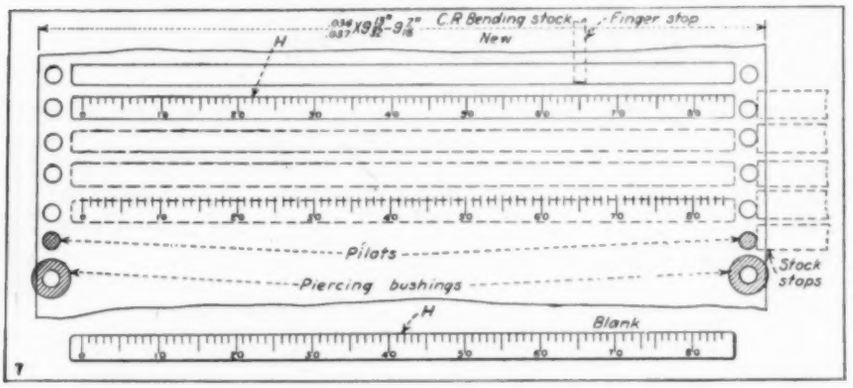


Fig. 7—A six-jump stock layout for a graduated scale

The stock layout shown is to graduate, number, and blank a long slender scale in one press set-up operation. At the first position of the stock, the pilot holes are pierced: at the second jump, the pilot pins locate the stock. At the third jump, the graduating and numbering is done across the strip of material. The graduating punches are designed to project 1/32 in. over the future edge of the blank to insure the extension of the graduating lines over the edge of the piece. Three jumps between graduating and blanking are necessary to prevent the spread of the material resulting from the pressure of the blanking punch from springing the graduating punches just before shearing of the blank.

If parts were graduated in a separate operation, after blanking the side marked *H* would be elongated ⅛ in. or more, making the finished parts curved in shape. The cost of straightening parts to have parallel straight sides will warrant the cost of the extra width of material and the expense of construction of the style of die required by the layout. This layout shows that it is not always economical to save stock. In this case, while there is an increased cost of material in the layout because of the extra width required for pilot holes on each side, it will result in a large labor saving.

5 to a screw in the top of the stripper and this spring holds the inside bottom edge of the stop down against the die. This is not shown on the plan of the die and stripper.

When holes are required in the blank and a follow die is to be used requiring two or more jumps of the stock to obtain the finished piece, the stock stops must be placed so that the front end of the stock will come on the edge of the blanking or piercing punches if it should happen that the end of the stock is not square with the sides. Whenever possible, the principal and two holes that are to be picked up with pilots in the same jump should be positioned on three or more jump requirements. The finger stop should gage against a projecting radius when it can be done. Extra, suitably-sized, pilot holes must be provided in the scrap section between blanks or on the margins of the stock if the holes in the blank are smaller than $\frac{31}{32}$ in. in diameter. Suitable pilot holes should be selected as far apart as possible. Holes in stock 0.050 in. in thickness or over should not be pierced if the diameter is less than the thickness of the stock.

Coil stock can be obtained in rolled form more cheaply from the mill and is cheaper to handle in blanking, if the nature of piece in regard to thickness and bends will permit. This stock is used for thinner parts up to 0.040 in., and sometimes up to 0.050 inch.

Many factories carry an unnecessarily large number of widths of the same thickness and temper of stock. Fewer widths can be stocked at a reduction in cost of extra handling for gaging, oiling, and stocking if the die designer familiarizes himself with the ordinary sizes carried in the storeroom and selects a width up to and not more than ¼ in. greater than required by his new blank requirement. A "Stock Size Summary Card" is used for carrying this information, and this card should give all of the part numbers requiring the stock specified, with the length, amount in pounds required for 1,000 parts, number of parts used per unit machine, and any unusual specifications. In Fig. 3 is illustrated a sample "Raw Stock Summary Flat Stock Card" used in one plant. If the designer figures his extra separate storage space at $1.50 per sq.ft. for a 10-ft. length or $15 per year for rental overhead, and adds the labor cost to gage, oil, and store the stock at say $10 per year, he will find that it is better to waste $20 per year on scrap stock by selection of a width on hand than to ask for an additional size to be stocked.

To make a stock diagram more presentable to the chief engineer or superintendent to approve, the die designer should figure out and put on it the tonnage of the press required to blank the steel piece. This can be approximated by the following formula:

Table of Stock Width Allowances

Material Thickness, in Inches	Stock Between Blanks, in Inches	Stock Between Blank and Outside Edge of Stock in Inches
0.005 to 0.030	3–64	5–64
0.030 to 0.050	1–16	7–64
0.050 to 0.070	5–64	9–64
0.070 to 0.090	3–32	5–32
0.090 to 0.120	1–3	11–64
0.120 to 0.150	5–32	3–16

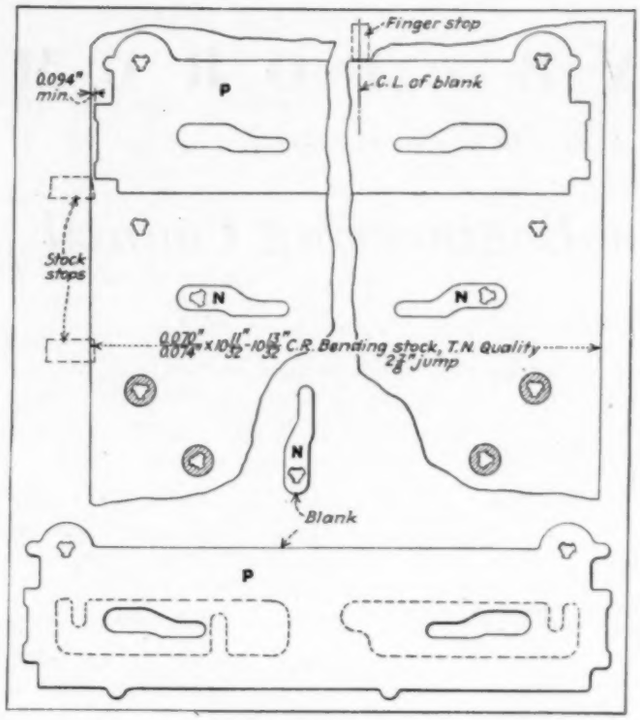


Fig. 8—Producing a second pierced blank from the blanked-out piece of scrap from the first. This layout for blank *P* would ordinarily give scrap as indicated by the dotted lines in the drawing of the blank. By adding another piercing punch, however, in the operation, the blank *N*, both right- and left-hand, may be produced from the scrap material with the hole pierced. The trimming out of the dotted portion of the blank *P* is not done until after the blank is bent, since a fair amount of surface is required to hold the piece against side pulls when the four sides are bent up.

Multiply the thickness of stock by 32 and the product of the two by the circumference of the blank to be made.

To find the strain tonnage of a power press this formula may be used for the calculation of an approximate value.

Square the diameter of the crankshaft and multiply the product by three.

It can thus be seen that plants doing much sheet-metal blanking cannot afford to countenance antiquated methods in die design and layout. The manufacturer under constant competition must be able to meet it by cutting costs wherever possible, and by striving to attain the greatest possible economy and efficiency throughout the plant. In this capacity, the designer can render an important service by proper layouts, eliminating one cause of excessive costs at its origin. He must be on the alert constantly for the supposedly minor items which in the long run total to an alarming figure. In that respect, his function is as important as that of the industrial engineer, and as vital in the attaining of true economy of material in the blanking operation.

Co-Operation Between Drafting Room and Shop—*Discussion*

By John F. Hardecker
Chief Draftsman, Naval Aircraft Factory, Philadelphia

As a consistent advocate of practical co-operation between the drafting room and the shop, it was but natural that I should read J. A. Potter's article on page 45, Vol. 71, of the *American Machinist* with a great deal of interest. With his general principles I am in hearty accord, but I cannot help but feel that in his analysis he has eliminated the function of the inspection department.

In these days of high-speed shop production, the inspector is an integral part of any organization. His is an important and significant function. Therefore, in the case of any interference or difficulty in manufacture or assembly, I believe he should be called upon first to determine definitely whether the parts, materials, tools, and other items are as called for on the drawing.

The up-to-date drafting room is just as much on schedule as any other part of the organization. If the draftsmen are subject to the call of any shop when difficulty arises, it becomes impossible to maintain scheduled drafting dates. It also becomes too easy for the shop to shirk its own responsibilities and petition for help to check the job and drawings, when often the answer lies entirely within the jurisdiction of the shop. If help is not forthcoming immediately, the shop can charge the delay to engineering, and if the shop is shown to be in error afterward, spoiled work can be covered up by juggling time. I do not wish to convey the idea that this represents general practice, but it is always a possibility. In addition, the type of draftsman who would be skillful in solving such interferences is usually among the highest-paid employees in an organization.

Therefore, I believe drafting help should be denied until the inspector has determined definitely that all drawing requirements have been met. In the meantime, since the delay is still in the shops, the shop supervisors will take naturally an active part in trying to find the cause of the difficulty. When the work has been checked against the drawings and the difficulty is still existent, the drafting room should be called upon. The co-operation then extended can be properly whole-hearted, thorough, and prompt. Even more important, it can be direct, for the problem is greatly narrowed down. Experience has shown that in any large organization where drafting help is to be had for the mere asking, certain shops make many more calls than others, a difference far greater than logically can be attributed to the type of work. Insisting that the inspector first check the job against the drawings has been shown to reduce materially the number of requests for help.

To try to "save the job" on spoiled work by modifying or waiving certain requirements, or by reworking the job, is an important co-operative function of the drafting room. However, even here, the inspector should not be circumvented. It is not proper and fair to issue such instructions directly to the shop, and leave the inspector "out in the cold." He is entitled to proper consideration.

EXECUTIVE · FORUM

Holland Suggests an Engineering Council

WILLIAM HOLLAND, adviser extraordinary to baffled manufacturing executives, sat at lunch with Howard Hedley, general manager of the Standard Manufacturing Corporation. He was the guest of that worried gentleman at the suggestion of the latter's banker.

"Mr. Holland," began his host as the cigars made their appearance, "you put me greatly in your debt by coming down here today."

"Not at all, sir," replied Holland with a smile. "That was one of the best lunches I've had in a long time. I think the shoe's on the other foot."

"I wish I could find the way out of most of my troubles as easily as I can order a luncheon. Here's what I'm up against. We are losing orders and the good will of old customers because our product engineering is not up to date."

"Well," broke in Holland, "at least you know what the trouble is, and that's half the battle. It's hard to get manufacturers to realize how important a properly engineered product is. Some of them think that they can continue to compete on the strength of splendid manufacturing methods alone, or on shrewd purchasing of materials. It can't be done. Take the automobile field, for example. Look what the Chrysler and Auburn interests did to some of the old timers with their new models. But please forgive me. You got me started on one of my hobbies, and it's hard to stop."

"Don't apologize. I'm delighted to learn that we agree on product engineering. My chief engineer understands the situation but he's been blocked, time after time, by the active or passive opposition of some of our other department heads. The superintendent is justly proud of his smooth-running organization and he resists any change that will tend to disturb it. The purchasing agent instinctively objects to design changes that will involve the use of costlier materials. The treasurer can't see why we should spend a lot of money on engineering research.

"I could step in and force the issue, of course, and once or twice I have had to speak plainly to save avoidable trouble. But I don't like to give orders to department heads. I want them to get together and compromise their own differences without executive interference."

"Well spoken, sir. I wish some of my other managerial friends thought as clearly as you do. But, tell me, haven't any of your department heads ever been able to get together on such differences?"

"Oh, yes, but usually only where there were just two men concerned. When a problem involved three or four departments, there were too many varying points of view and the results were unsatisfactory."

"Well, look here, Mr. Hedley, as my other friends know, I hate to give direct advice but I'm going to do it this time.

"I believe you could adopt a scheme that is working well in a western plant which I visit occasionally. The manager there instituted what he calls an engineering council and it meets periodically, every fortnight, I think, to consider just such situations as you have described."

"How is this council made up?" inquired Hedley.

"It is presided over by the chief engineer, and it includes every department head and some of the minor executives further down the line. I should explain that when problems involving only two or three departments are up the council consists only of the men interested. It is very flexible and can expand or contract to suit the need of the moment."

"Sounds sensible to me, Mr. Holland."

"I thought it would, and I strongly urge you to try it out."

"Thank you, I will. I'll organize it at once and call the first meeting for next Thursday."

The Engineering Council, which has been proposed in the foregoing discussion, will be a feature of the first Product Engineering Number of the *American Machinist*, to be published next week. It will appear regularly, in place of the Executive Forum and Foreman's Round Table, in subsequent Product Engineering Numbers which will be published as the second number each month.

DISCUSSION

What Is Modernization?

By making a complete analysis of the machines in his shop, at regular intervals, a manufacturer can determine whether or not each machine is still operating profitably, or whether it should be replaced by one of newer design. The analysis should take into account the condition of the machine, the cost of upkeep, production rate, and labor required for operation. Cost figures on equipment in operation may then be compared with those for the most improved machines on the market, to ascertain the advantage that might result from replacement.

Large organizations can well afford to employ competent men to spend their entire time on this work. No machine user, however, can afford to neglect such studies entirely. Even though the equipment in service may be in good condition, if it is of obsolete design it has undoubtedly outlived its usefulness on the basis of economic return.

—HARRY KAUFMAN, *Public Accountant.*

Handicapping Salesmen with Wrong Information

Not long ago I came across a salesman from a nearby plant who informed me that his factory had at last devised a system whereby all equipment shipped out would be identical with sizes on the blueprints rendered. It happened that the plant was manufacturing a product used in all cases in conjunction with equipment put out by other manufacturers. Complaints were coming in from different sources that the equipment was not meeting the dimensions called for on the blueprints sent out before the machinery was shipped. The company traced the trouble and found that the engineering department, when changing over the various designs, was not destroying the old prints stocked in the files, with the result that the old prints were sent out on the job, and when the machinery was forwarded to the customer, it would not be as described.

The method of placing new issue numbers on the drawings was then tried out, with results but little better. After a conference between the chief engineer, sales manager, and plant manager it was decided to take care of all changes in the following manner: Let us say that a drawing covering the design of a small motor was numbered SK-84693, Issue 2. When a change was made in the drafting room, instead of numbering the new drawing SK-84693, Issue 3, they would number it SK-846931 3, and a later issue would be SK-846931 4, etc. Every motor built in accordance with the changed drawing would be numbered and stamped accordingly, the salesmen would have new prints sent to them for their loose-leaf folders, and they, in turn, would destroy the previous copies of the prints.

By pursuing this method, when motors or machines were shipped out, the dimensions were found to be exactly as called for on the prints, and complaints were no longer received. We have purchased considerable quantities of this company's equipment, and in checking against the blueprints we have found the dimensions to be as specified.

—FRED A. SCHMIDT, *Industrial Engineer, Western Electric Company, Inc.*

Cash or Royalty on Machines?

If a single cash payment is made for the design of a new machine, it is likely to be as low as it can be squeezed, and, should the design or patent later turn out to be a winner, the originator has lost all his rights. The really sound business proposition is that to which Bill Holland lent his influence, a preliminary cash payment—on account of royalties, preferably—and a satisfactory royalty, with a protective clause providing for a minimum annual payment over an agreed period of years.

This arrangement takes care of any case where the design is not used, or, in the case of a patent, where the licensee has taken up an invention with a view rather to eliminating competition with his present lines than to its successful development.

If an invention or design adequately fills a definite need, the demand for it is likely to exceed even its designer's wildest hopes, and under the royalty system his remuneration would be adequate. If he has real confidence in his work he surely cannot fail to see that this is thus the most satisfactory scheme for him. The licensee, on the other hand, loses a minimum of capital if the work is not up to the designer's expectations.

—C. NORMAN FLETCHER, *Cheshire, England.*

Net Results—Not First Cost

At the time it is introduced, any new process or material has a high first cost. This is true of the new cutting alloys. Yet their use results in an ultimate economy. The output is increased, number of rejections is reduced, idle time is lessened, and quality is maintained with less effort. More work is turned out in the same time and this increase lowers the labor cost.

While the first cost of tools made from the new cutting alloys is considerably higher than that for tools of other materials, the upkeep cost is much lower. Moreover, the increased quantity of production, with the reduced amount of spoilage, gives a larger number of pieces over which to spread the total tool cost and overhead. As a result, the cost per piece is lower.

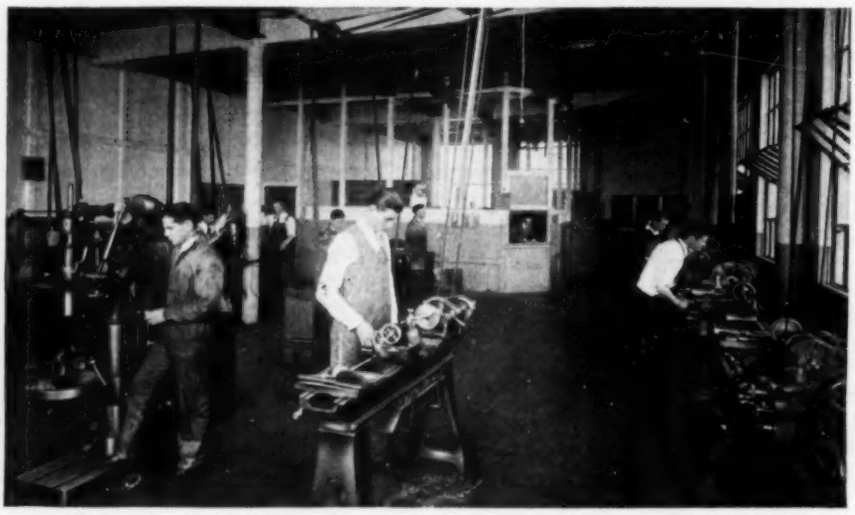
The tool having the lowest cost per piece produced will return the greatest profit on its use, and is the one that should be purchased. The net results are far more important than the first cost.

—L. O. BROWN, *Toolroom Foreman, Holcomb & Hoke Manufacturing Company.*

A Southern School Shop that Duplicates Industrial Conditions

By Loui Greet
Director of Vocational Education, Parker School District, Greenville, S. C.

THE Parker High School, of Greenville, S. C., is located in a district in which there are fifteen textile plants and it is natural, therefore, that vocational training should tend along the lines of practice in such plants. All seventh- and eighth-grade boys in the junior high school are required to take work in the general shop so that they may get a sample of the three trades taught in the senior high school, which are machine shop practice, carpentry and cabinet making, and textiles. Not only do these boys do some of the manipulative operations involved in each trade, but they make a study of the advantages and disadvantages of the trades, wages paid, working conditions, and how the tradesman fits into the scheme of things. When the pupils reach the ninth grade they are allowed to choose which shop course they wish to take as a specialty.



A view of the machine shop of the Parker High School, Greenville, S. C., showing the general layout

About one-half of the senior high school boys elect to take the vocational curriculum and about one-third of these select machine shop practice, and spend fifteen hours a week in the shop for the next three years. In addition to the shop work, the machine shop boys have mechanical drawing four hours a week for two years and machine shop mathematics for four hours a week for one year. They also learn English, mathematics, history and physics from the academic departments of the high school.

The mechanical drawing is very closely related to the shop work as pupils are required to make at least a free-hand sketch of the articles to be worked on in the shop. This drawing is required before work is started on the article.

In the shop there are two 16-in. by 8-ft. quick-change gear lathes, one 20-in. by 10-ft. quick-change gear lathe, and three 9-in. lathes. There is also a back-geared crank shaper, a universal milling machine, a 20-in. drill press, a 20-in. by 4-ft. planer, a hack sawing machine, and a grinder stand. The use of machinists' hand tools and precision instruments is taught, and the shop has an ample supply of these.

The textile plants in the Parker School District cooperate and send a variety of work into the shop to be done by the pupils. Most of these plants have well-equipped shops of their own, but are glad to send in part of their work to the school. Many studs and gears have to be machined, as these are standard parts for looms and frames. Ratchet, spur and spiral gears are cut also. In addition there is opportunity to do a little experimental work for plants not having completely equipped machine shops. Some work is also done for individuals, in which case the individual furnishes the material, and a small charge is made for overhead.

Besides jobs done for plants and individuals there are several carefully-worked-out projects involving operations not found in the general run of work obtained from the mills. Building a three-speed bench drill is the most complicated of these. A 20-ton jack screw is used to teach the chasing of square and acme threads, and each of the boys make one or more portable bench vises during the school year.

One of the outstanding things, from an instructional standpoint, done by the present classes was the moving of the machine shop equipment from the basement of the high school building to the second floor of the vocational building, where it is now housed. All machines and line and countershafts were taken down by them, moved, and set up again.

From the foregoing, it can be seen that there is plenty of opportunity to turn out boys trained on the very kind of work they will have to do when they leave school. For that reason, the boys can be placed without much trouble, although the field is somewhat limited due to the fact that there is very little turnover in the local machine shops.

In spite of the fact that bolt manufacturers have very generally agreed on the meaning of the terms "bolt" and "screw" there still seems to be confusion in the shop as to the difference between a bolt and a screw. According to the standard designation laid down by the Bolt, Nut, and Rivet Manufacturers Association a bolt is a screw with the nut attached.

Limit Gaging—

Can an International System be Established?

By JOHN GAILLARD

Mechanical Engineer, American Standards Association

Manufacturers must make their own choice between the "basic hole" and "basic shaft" systems, also between the "bilateral" and "unilateral" systems

SINCE the idea of a national standard is that it will supply as many branches of the manufacturing industries as is possible with a set of standard fits that will cover their needs, it is obvious that a national standard should included both the "basic hole" and the "basic shaft" systems. There need be no more fear about confusion in industry arising from the existence of both systems side-by-side as national standards, than there would be from the standardization in one country of two kinds of screw threads—coarse and fine. Manufacturers in the same branch will usually select one of two systems as being more appropriate for their particular purposes. For example fits between component parts of transmission equipment, such as shafts, pulleys, gears, couplings, etc., require by their very nature the use of the "basic shaft" system.

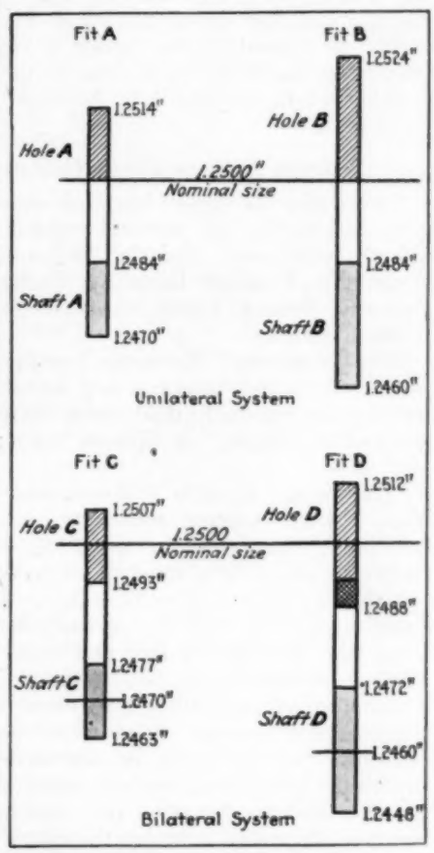


Fig. 3—Effect of increasing the tolerances on mating parts in the unilateral and the bilateral systems

Where products of two industries, one of which works to the "basic hole" and the other to the "basic shaft" system, are to be combined, a compromise must, of course, be made, as in so many cases where standardization is applied. Special consideration should be given to the question as to what system should be used for the shaft extension of an electric motor for general purposes, and which may be coupled to equipment of varying nature. Such more or less exceptional cases are, however, negligible as compared to the large number of cases that evidently call for the application of a specific one of the two systems.

In the following fourteen countries, both the "basic hole" and the "basic shaft" systems are given in the national standards, either definitive or proposed: Austria, Belgium, Czechoslovakia, Denmark, Finland, Germany, Holland, Italy, Japan, Norway, Poland, Russia, Sweden and Switzerland. In the American and British standards, the "basic hole" system has been adopted exclusively.

According to the definition given in the American standards, the tolerance on a part is the amount of variation permitted in its size. Once this permissible variation has been decided upon, it may be given exclusively on one side of the reference line, in which case it is called *unilateral;* or parts of the total variation may be allowed on both sides of the reference line, in which case the tolerance is known as *bilateral.* The two parts of a

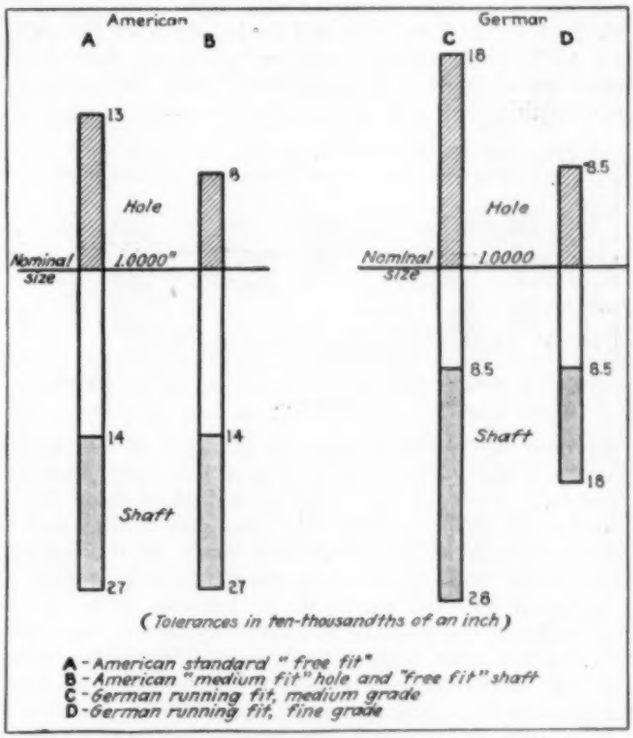


Fig. 4—Difference in "grade" of fits of the same class; German and American practice

The second part of the article. The conclusion will appear in an early issue.

bilateral tolerance lying on opposite sides of the reference line may be equal or unequal. The former case, in which the tolerance is symmetrically divided by the reference line, represents the most common form of bilateral tolerance, but there have been proposed other systems (for example, the British Newall system) in which the two partial variations are unequal. There is no national standard recommending such non-symmetrical division of the tolerance.

The unilateral system of tolerances is now generally recognized as being preferable in principle to the bilateral system. One reason is that the use of unilateral tolerance makes it much easier for the designer to visualize the loosest and tightest fits that may occur between the two parts. For example, when the limits of a hole are 1.0026 in. and 1.0014 in., and the limits of a shaft are 1.0000 in. and 0.9988 in., respectively, the fit may be defined on the drawing in the unilateral system as follows:

$$\text{Hole: } 1.0014 \ ^{+\,0.0012}_{-\,0.0000} \qquad \text{Shaft: } 1.0000 \ ^{+\,0.0000}_{-\,0.0012}$$

It is now easy to see that the minimum clearance of this loose fit is 0.0014 in. (the difference between 1.0014 and 1.0000 in.) and that the maximum clearance is $0.0014 + 0.0012 + 0.0012 = 0.0038$ in. In the bilateral system, however, the fit would be expressed as follows:

Hole: 1.0020 ± 0.0006 Shaft: 0.9994 ± 0.0006

Finding out what the minimum and maximum clearances amount to is more difficult in the bilateral system and therefore the possibility of errors is greater than in the unilateral system.

Another advantage of the unilateral system is directly connected with the requirements of manufacturing practice. Under certain conditions, it may be desired to change the tolerances on the mating parts, while the minimum clearance is satisfactory and must, therefore, be maintained. In such a case, if unilateral tolerances are used, two limits only have to be changed, namely, the high limit of the hole and the low limit of the shaft. In the bilateral system, however, all of the four limits must be changed. In comparison with the unilateral system this means, to begin with, two more changes on

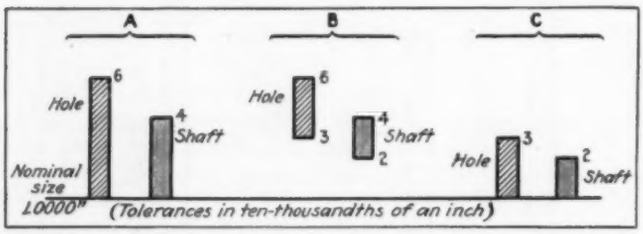


Fig. 5—Improvement in "grade" of fit through selective assembly

the drawing and corresponding changes in the dimensions of the gages used in production and inspection. Furthermore—and this may be still more important—such a change in bilateral tolerances may lead to lack of interchangeability between parts made to the original and those made to the new tolerances. This may be explained by the diagrams in Fig. 3, showing the influence of the increase in tolerance given on two parts having a free fit, both in the unilateral system at *A* and *B*, and in the bilateral system at *C* and *D*. Any "old" shaft *A* will have an acceptable fit with any "new" hole *B*, as will any "new" shaft *B* with any "old" hole *A*. The interchangeability between old and new parts is, therefore, perfect in this case. In the bilateral system, any "old" hole *C* will give an acceptable fit with any "new" shaft *D*, but an "old" shaft *C* and a "new" hole *D* may give too tight a fit. For example, any "new" hole *D*, the actual size of which lies within the double cross-hatched portion of its tolerance, gives too tight a fit with an "old" shaft *C* having its maximum permissible size 1.2477 in., and so forth.

Among the national standards now in existence or in course of development, the British standard is the only one in which the bilateral system of tolerances is given, and it is given there in addition to the unilateral system. This situation has a historical background that is rather significant. The British first adopted a national standard based on bilateral tolerances, in 1906. When the standard was revised in 1924, a transition to the unilateral system was made, in principle, but in order to take care of the needs of those who were still working to the old, bilateral system, it, also, was given in the new standard. However, the present British standard contains a recommendation to the effect that whoever can adopt the unilateral standard should do so. The fact that the bilateral system is still given in the standard must, therefore, be considered rather as a concession to existing practice made to avoid the disturbance that might be caused by too quick a transition from one system to another, rather than to the fact that the bilateral system is judged to be equally as good as the unilateral.

Fifteen Nations Favor Unilateral System

The unilateral system has now either been adopted or proposed as the sole national standard in the following fifteen countries: Austria, Belgium, Czechoslovakia, Denmark, Finland, Germany, Holland, Italy, Japan. Norway, Poland, Russia, Sweden, Switzerland and the United States.

The continental European standards differ in their set-ups from the American and British standards, in that the former explicitly distinguish between the "class" of fit, and the "grade," or "quality" of a fit, while the latter do not.

The "class" of a fit is determined by the allowance; that is the minimum clearance of a loose fit, or the maximum interference of a tight fit. Between loose and tight fits there is a kind of fit called "transition" fit, which may turn out to be a loose fit (large hole and small shaft); a tight fit (small hole and large shaft); or a slide fit (size of hole and shaft practically equal). The determination of the allowance is the first question to be decided upon when a fit must be specified. For a loose fit, for example, the minimum permissible clearance between the parts may be determined by the requirements of proper lubrication, while the maximum permissible clearance may be governed by the fact that still greater looseness between the parts would impair the accuracy of their functioning. The latter requirement is very obvious, for example, in the case of the spindle of a machine tool, where the accuracy of finish of the parts operated upon depends directly on the amount of relative freedom between the spindle and its bearings. In the case of a tight fit, a certain minimum of interference must be observed, or else the two parts would not remain properly connected, whereas the maximum possible interference may be governed by the greatest pressure allowable between the parts without risk of cracking the exterior part.

The smaller the difference between the minimum and the maximum clearance, or interference, the more exacting are the requirements of the fit between the parts. In fact, the difference in question is equal to the sum of the tolerances on the mating parts, and a small permissible variation in clearance, or interference, cannot, therefore, be maintained without keeping the tolerances on each part small; a requirement that raises the cost of production. Fits that must comply with such exacting conditions are called "high-grade," or "high-quality," fits.

American Standard Allows Selection

The American standard, although specifying eight fits completely, leaves the designer free to combine, if he so chooses, a shaft specified for a certain standard fit, with a hole specified for another standard fit. An example for parts having a nominal size of 1 in. is shown in diagrams *A* and *B*, Fig. 4. Diagram *A* represents the tolerances in the hole and on the shaft of an American standard "free" fit (class 2), while diagram *B* shows the combination of a shaft having a "free" fit (class 2) with a hole of "medium" fit (class 3). In both cases, the minimum clearance is 0.0014 in., while the maximum clearance, according to diagram *A*, is 0.0040 in. for the standard fit, and according to diagram *B* it is 0.0035 in. for the selected fit. In the British system, also, different "grades" of fit of the same class can be obtained by combining the same shaft with holes having different tolerances. The converse also is true.

The Continental standard systems of fits are typical, in that they are subdivided into groups according to their quality, each group continuing a series of fits of different classes. Thus, the German standard distinguishes between four groups of fits, the grades of which are designated as follows: "Precision," "fine," "medium" and "coarse." In Fig. 4, diagrams *C* and *D* show the manufacturing limits of two parts having a nominal diameter of 1 in. for German "medium" grade and "fine" grade running fits, respectively. In both cases, the allowance is 0.00085 in., but while the maximum clearance of the "fine-grade" fit is 0.00265 in., it amounts to 0.00460 in. for the "medium-grade" fit. The "fine-grade" running fit will be used, for example, for a ground-steel machine tool spindle and the reamed surfaces of its bronze bearings, while the "medium-grade" running fit is good enough for the fit between the ground crankshaft of a steam engine and the bored and scraped surfaces of its white-metal main bearings.

Selective assembly has for its purpose the improvement of the grade, or quality, of the fit. That is, to reduce the possible total variation in clearance, or interference, between the two mating parts without having to keep the tolerance on the parts very small. This is attained by subdividing the tolerance on each part into a number of zones and by mating a hole, the actual size of which lies within a specific zone of its tolerance, with a shaft, the actual size of which lies within a corresponding zone of its own tolerance. In other words, large holes are mated with large shafts, medium holes with medium shafts, etc. The possibility of a relatively large hole (size close to high limit) being mated with a relatively small shaft (size close to low limit), and conversely, is thus avoided. In selective assembly, the partial tolerances corresponding to the zones, thus acquire, in so far as the quality of the fit is concerned, the significance of the complete tolerance in interchangeable (non-selective) assembly, while from the viewpoint of manufacture, the advantage of working to a large tolerance on the parts is conserved.

The three diagrams in Fig. 5, representing the tolerances on a 1-in. hole and a shaft intended to give an American standard "wringing" fit (class 5), illustrate the principle of selective assembly. If no selective assembly were applied, as at *A*, the fits between the hole and the shaft would be permitted to vary from a loose fit having a clearance of 0.0006 in., to a tight fit having an interference of 0.0004 in., the total variation in tightness, or looseness, being 0.0010 in. This amount may be cut in half by assorting both the holes and the shafts into two groups, each group having the respective tolerances indicated at *B* and *C*. In mating "large" holes and shafts, as at *B*, the maximum clearance then becomes 0.0004 in. and the maximum interference 0.0001 in., while for the "small" holes and shafts, as at *C*, the corresponding

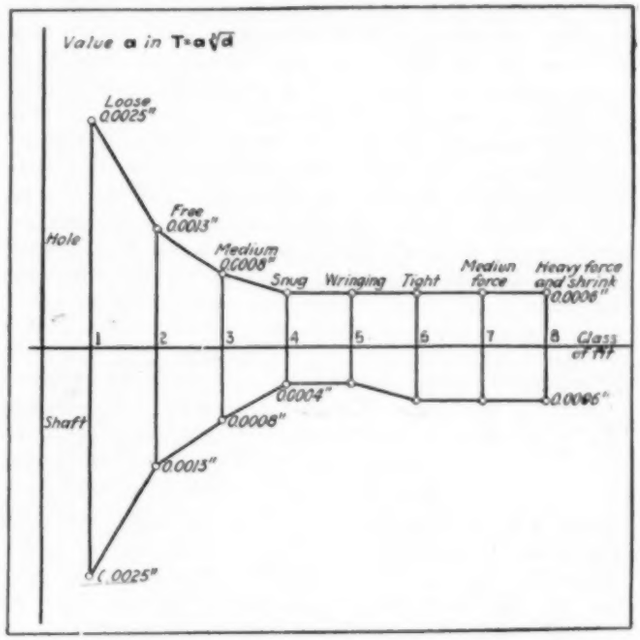


Fig. 6—Relation between tolerances on mating parts and their nominal diameter, for American standard fits

values become 0.0003 and 0.0002 in., respectively, the total variation being 0.0005 in. for either group. Further subdivisions of the total tolerance can be applied if desired, the result being an increasingly high grade of fit. It is evident, however, that this increase in grade must be paid for by the cost of the special requirements inherent to the process of selective assembly, such as the sorting of the mating parts by relative size.

Selective assembly is explicitly specified in the American standard with regard to the "wringing," "tight," "medium-force" and "heavy-force," or "shrink" fits (classes 5 to 8 inclusive), the purpose being to approximate as much as is feasible in practice, the average interference that has been selected as the most desirable.

A classification of the fits into groups on the basis of their grades has been made in the national standards, or proposed standards, of the following thirteen countries: Austria, Belgium, Czechoslovakia, Denmark, Finland, Germany, Holland, Italy, Norway, Poland, Russia, Sweden and Switzerland.

The national standards on fits have been established,

without exception, on the basis of practical experience. That is, much data were collected concerning fits that had given good results in the actual manufacture of different products of the mechanical industry. One or more series of standard fits were then set up by the national standardization committee concerned, consideration being given to the class of fit and, explicitly or implicity, to the grade of fit. When the problem of establishing such standard series was faced, the question naturally arose as to whether there could not be established certain formulas binding together in a systematic way (at least for a series of fits of the same grade) the tolerances on the mating parts.

The great majority of the national standards on fits have been established on the basis of such empirical formulas which (as they do not represent laws of nature, but simply a fair average of existing good practice) cannot serve directly for a general comparison between the several national systems. On the contrary, such a comparison can be based only on the actual fits specified by these standards. This method has been followed in the report of the German secretariat by means of a large number of diagrams showing side-by-side the tolerances and allowances of those fits in different national systems. It appears that some fits are approximately identical, while others are entirely so. In several national standard systems there is a fixed ratio for a series of fits of the same kind, between the tolerance on a part and the cube root of its diameter. This relationship may be expressed by the following formula:

$$T = a\sqrt[3]{d}$$

in which: T = the tolerance on the part, in inches.
d = the nominal diameter, in inches.
a = a constant factor depending upon the class of fit, and in some cases on the part itself (whether hole or shaft).

The values of the constant a for the eight American standard fits are given in Fig. 6, diagram A, which shows that for six of the fits, the tolerances on the hole and on the shaft are equal, while for the two fits ("snug" and "wringing"), the tolerance on the hole is smaller than that on the shaft. To give a concrete example: as the factor a, has a value 0.0013 for both the hole and the shaft for free fits, the tolerance on each of the mating parts having a nominal diameter of 8 in., amounts to $0.0013\sqrt[3]{8} = 0.0026$ inch.

The allowances of the American "loose," "free," "medium" and "snug" fits (classes 1 to 4 inclusive) are based on a different formula, namely:

$$A = b\sqrt[3]{d^2}$$

in which: A = the minimum clearance, in inches.
d = the nominal diameter, in inches.
b = a constant factor, the value of which depends upon the class of fit.

The average interferences of the American standard "wringing," "tight," "medium-force" and "shrink" fits (classes 5 to 8 inclusive) are determined by the general formula:

$$I = cd$$

in which: I = the average interference, in inches.
d = the nominal diameter, in inches.
c = a constant factor, the value of which depends upon the class of the fit.

SEEN · AND · HEARD

By JOHN R. GODFREY

Springs and Standardization Floating vs. Rigid Reamers

STANDARDIZATION of springs presents many difficulties because of the varying demands for different lengths, sizes, and strength. Main springs for 8-day clocks are, however, practically standardized. As far back as 1860 one spring company began making springs for 8-day clocks that were $\frac{3}{4}$ in. wide and 0.017 in. thick, and these springs are still standard for 8-day clocks. Perhaps the solution of the standardization of many similar products might be to accept the practice of old-time manufacturers where their product is widely used, probably after weeding out the inconsistencies.

Most of us would prefer dimensions that seem rational, that have fairly regular increments, and are in even figures where possible. But the main object of standardization is uniformity of product and not ideal dimensions. And while we would much prefer to use 0.25 in. instead of 0.231 in., the exact size really makes little difference if we can depend on the new part giving the same performance as the old, whether it be a bolt or a clock spring. The application of large quantities of common sense is a great attribute for members of a standardizing committee, no matter what the product may be.

* * * *

STANDARDIZATION, to the point of eliminating individuality, is still a long way off. An example of this is to be found in the use of floating holders for reamers, which is fairly common in many shops. In one large plant, however, where production is considered both from a quality and quantity standpoint, the floating reamer holder is taboo.

The engineer in charge of this shop feels that the floating reamer is responsible for bell-mouthed holes and that the results in long holes, such as cylinder bores, are not satisfactory. He goes to the other extreme and holds reamers in a large, rigid spindle that maintains alignment and tends to prevent both the bell-mouth and the following of the previous bore.

Still others use this same idea for rough boring the cyinders. Instead of using long, slender bars with guides at each end, they make the boring bar as large as possible, and mount it in a large, stiff spindle. This, they contend, gives better alignment than is secured by guiding the bars in the usual manner.

Cutting possibilities on the "stunt" jobs that arise occasionally in the shop can be judged from some tests made at the Philadelphia Navy Yard with Carboloy tools. Hard rubber was turned in the lathe at a cutting speed of 200 ft. per min. with a depth of cut of $\frac{9}{16}$ in., and a feed of carriage of $2\frac{5}{8}$ in. per min. The tool edge remained sharp during the entire cut. Bakelite was turned at a cutting speed of 97 ft. per min. with a $\frac{1}{8}$ in. depth of cut.

The completed master pump cylinder and its parts

Chrysler Hydraulic Brakes

Production Tools and Operations

By EDWARD C. LEE
Chief Tool Designer, Chrysler Corporation

THE PUMP cylinders are gray-iron castings made to the same specifications as those for the brake cylinders. After being annealed, the bores are core drilled, reamed, counterbored, chamfered and recessed. One end is form turned, the flange is faced and three holes are drilled in the flange. All this work is done in one-setting in a multiple-spindle chucking machine of the horizontal type, as shown in Fig. 11. The drill head is carried on the fifth spindle and is not visible in the illustration. The drill spindles are operated by planetary gearing. While not in use, the drill head is constantly revolving at a rate a little slower than that of the spindle. When the head advances to the drilling position, it makes engagment with the chuck through a spring-operated plunger entering one of the three slots to be seen in the faces of all the chucks. While in such engagement, the drill head revolves at a much higher speed than the spindle with which it is engaged. The production is 90 per hour.

The work is then located from the bore and is rough and finish turned and threaded. Production is at the rate of 200 per hour.

Upon completion of this operation, the hole for the inlet connection from the supply tank is drilled, bottomed and counterbored, and the boss is faced in a drill press equipped with a four-spindle head and a plate for carrying the necessary guide bushing, as shown in Fig. 12. The holding fixtures are mounted on a five-station indexing table. The work is located by the bore and by one of the holes in the flange, and is secured in place by a swinging clamp. Productions is at the rate of 100 pump cylinders per hour for the above drilling operations.

Next, three holes are drilled at the bottom of the inlet connection for regulating the flow of the liquid into the cylinder from the supply tank. The work is done in a four-spindle sensitive drill press, as shown in Fig. 13. The fixture is moved from station to station, being located by pins in the table of the machine, so that the bushing for the hole to be drilled is automatically centered under the proper spindle. The production is 110 per hour. Then the inlet hole is tapped for the pipe connection in a drill press carrying a tapping attachment in its spindle, as in Fig. 14. The work is held in a simple fixture by a plug through the bore. The inlet hole is brought into vertical alignment with the machine spindle by a plug in the upright part of the fixture engaging one of the holes in the flange. Production is at the rate of 175 per hour. The ends of the cylinders are chamfered in the same machine in which the like operation is done on the brake cylinders, described in the first article.

The next operation is that of grinding the bores. As in the brake cylinders, the pump cylinders are held in a fixture attached to the spindle of the internal grinder. They are located by the chamfers in the bores and are held in place by spring pressure. A close-up view of a cylinder in the fixture, with the grinding wheel at the right, is shown in Fig. 15. From 0.008 to 0.010 in. of stock is removed by grinding and the production is 33 per hour. The bores are lapped in the same manner and in the same machine as are those of the brake cylinders.

Then the cylinders are ready for inspection and the pressure test. For

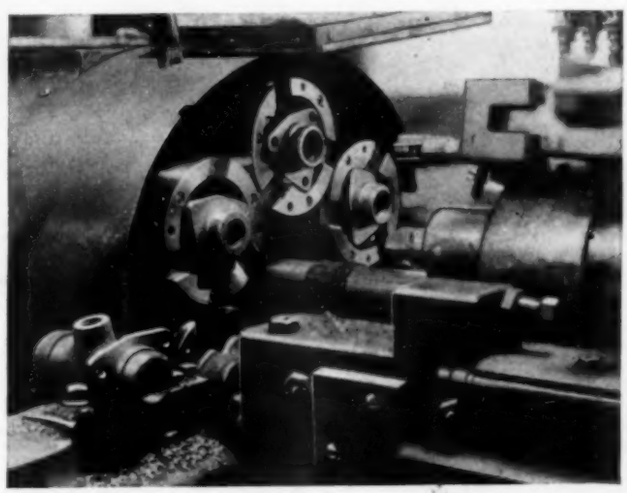


Fig. 11—Facing and drilling the flanges and turning and forming the ends of pump cylinders. The work is all done in a multiple-spindle chucking machine. The drill head is carried on the fifth spindle and is not visible

Conclusion of the article. The first part appeared on page 171, Vol. 71.

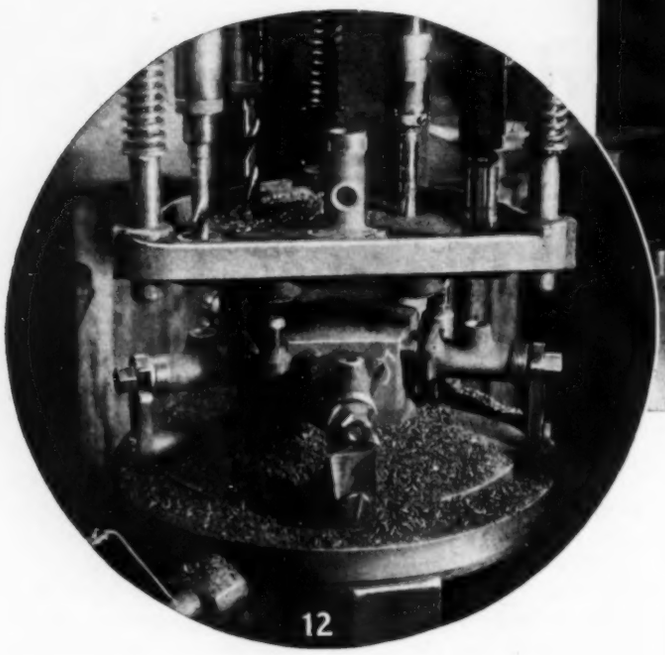


Fig. 12 — Drilling, bottoming, counterboring and facing the boss for the inlet connection from the supply tank. The work is done in a drill press equipped with a four-spindle head and a five-station indexing table. Location is by the bore and one of the flange holes

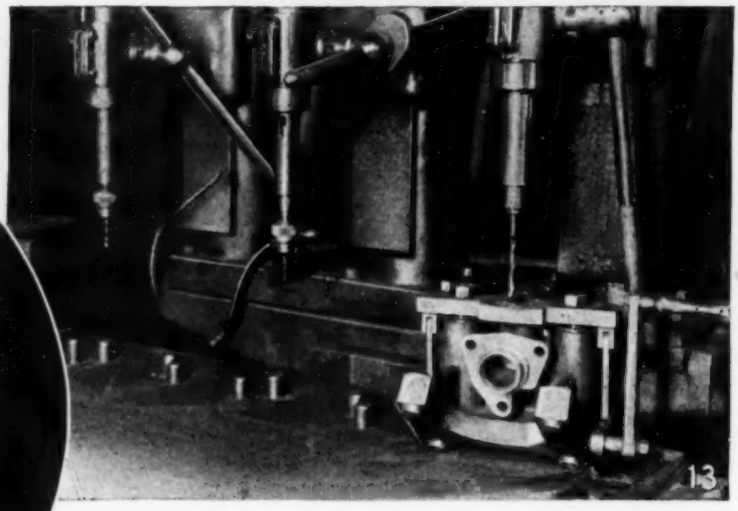


Fig. 13—Drilling three holes at the bottom of the inlet connection. The work is done in a four-spindle sensitive drill press. The fixture is moved by hand from station to station, being located in alignment with the various spindles by pins in the machine table

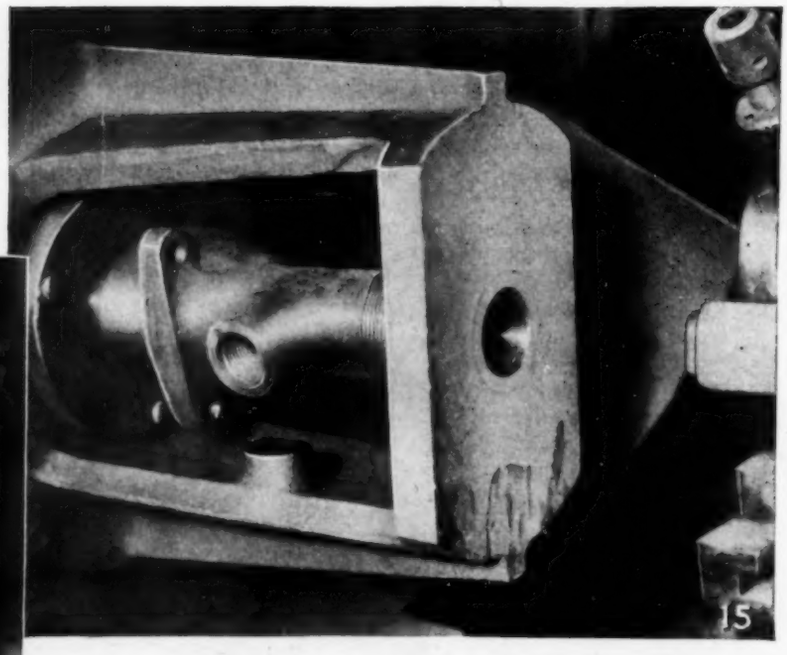


Fig. 14—Tapping the boss for the inlet connection in the pump cylinder. The work is held in a simple fixture by a plug through the bore. The boss is brought into vertical alignment by a plug in the fixture

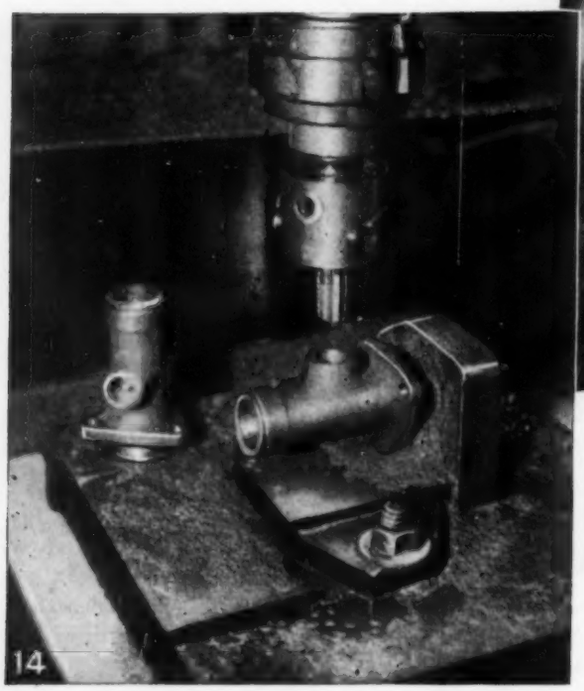


Fig. 15—The grinding fixture. The work is located by the chamfered surfaces at the ends of the bore and is held by spring pressure. From 0.008 to 0.010 in. is removed. Production is 33 per hour

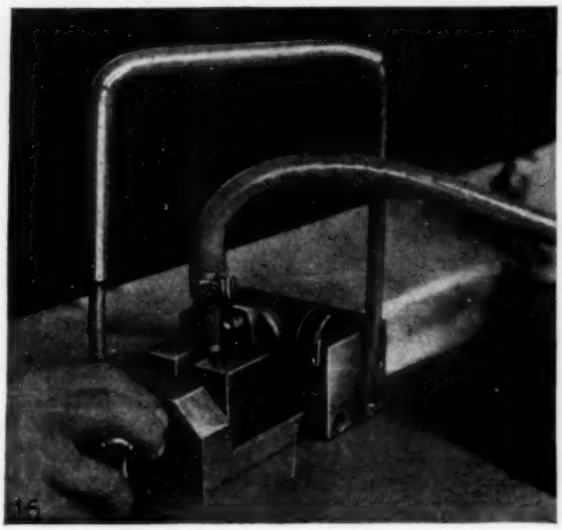


Fig. 16—After inspection, the cylinders are tested for leaks in this fixture. After all connections have been made tight, the fixture and cylinder are submerged in the small tank at the right.

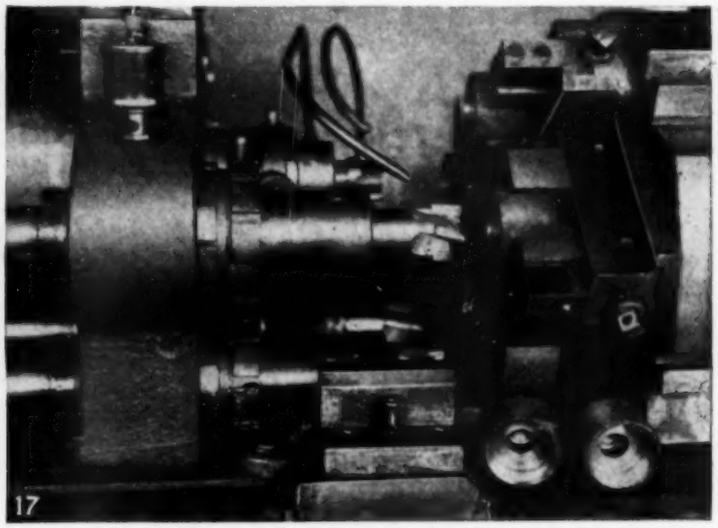


Fig. 17—Set-up for machining the heads, or caps, of the pump cylinders in a multiple-spindle chucking machine. The parts are bored, reamed, chamfered and tapped

the pressure test, they are held in the fixture shown in Fig. 16, connection to the pressure system being made of flexible hose. When all joints have been made tight the fixture and cylinder are submerged in the small tank at the right. A bale attached to the fixture facilitates handling it in and out of the tank.

The heads, or caps, for the pump cylinders are bored, reamed, chamfered and tapped in a multiple-spindle chucking machine, the set-up being shown in Fig. 17. After they have been assembled to the cylinders, two holes are drilled in them and are afterwards tapped. One hole is for the connection to the stop-light switch and the other is for the outlet connection to the brake cylinders.

Effect of Tin, Lead, and Zinc on Bearing Bronzes

BASED on hardness tests, Izod impact tests, repeated pounding tests and wear tests, both with and without lubrication, at temperatures within the range 70 to 600 deg. F, the bronzes containing a high percentage of copper are classified according to the character of service for which they seem to be best adapted in a paper by H. L. French and E. M. Staples, entitled "Bearing Bronze With and Without Zinc," presented at the annual meeting of the A.S.T.M., held at Atlantic City, N. J., June 24 to 28.

Bronze with less than about 4 per cent of tin are unsuited for general bearing service because of low resistance to deformation and rapid wear in the absence of lubrication. However, some of these alloys, such as those high in lead, can be used satisfactorily for special service involving low loads.

Bronze with less than about 5 per cent of lead appear to be suited only for service where lubrication can be maintained. However, they are applicable with such a restriction to a wide range of service conditions depending upon the proportions of tin present. With low tin, the alloys are tough but do not resist deformation as well as the bronzes high in tin.

Bronzes containing more than about 5 per cent of lead are best able, of any of the groups studied, to operate for short periods in the absence of lubrication. Bronzes with 15 per cent of lead are better in this respect than bronzes with 5 per cent lead, but there are no appreciable advantages apparent in raising the lead above about 15 per cent. In fact, some disadvantages are encountered in that the toughness is decreased in bronzes containing 4 to 8 per cent of tin. However, by varying the proportions of tin and lead in the bronzes of this group, varied mechanical properties can be obtained.

The addition of 4 per cent of zinc to the bronzes has in general, small influence upon the properties of the bronzes studied. With two exceptions, such changes as have been observed seem beneficial rather than detrimental for bearing service, since they comprise a tendency toward higher hardness and resistance to deformation, lower friction and lower wear without oil.

Further development of methods of test for wear in the presence of lubricants may show that zinc tends to increase the weight losses and duration of the "wearing-in" period of bronze bearings, but since this is also a function of the perfection of fit such effects would be disadvantageous only in certain cases. The addition of 4 per cent of zinc does not appreciably affect the wear rates subsequent to the "wearing-in" period.

In general, the results seem to justify the conclusion that the effects of zinc up to 4 per cent are generally small and may be insignificant in comparison with changes in properties quite readily produced in bronzes from variations in foundry practice. This should not be construed to apply to additions of zinc when other impurities are present.

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions given at the foot of the page have been prepared

Buying or Making Special Tools?

"WILLIAMS is a sort of puzzle to me, Al," said foreman Ed, as they walked home.

"What's troubling you now, Ed?"

"Why it's this. He always seems to want to send work outside that we can do here just as well. Tom Black, in the toolroom, tells me he's buying die-sets outside instead of making them as we used to do. Tom says his die-sets were just as good as the new ones and he's a bit sore over the new deal."

"I knew Williams was thinking about it, Ed. Now if you'll think things over a bit you'll remember that Williams doesn't very often go off half-cocked. He's a pretty level headed boss, Ed, and I'm betting he's figured it all out before he made the move."

"But why throw our men out of a job so as to give work to someone else?"

"He hasn't thrown anyone out, and he isn't likely to. He wants to release them for other work, Ed, and he's very sure he can save money for the firm by buying standard parts such as die-sets."

"Tom thinks they must cost more than those he made, especially when you see how classy they're made, and count the profit of the makers."

"Tom probably has very little idea of cost beyond the labor and material—those are the only costs most shop men think about."

"But why not make them ourselves, and have everything independent of other shops?"

"Now you're going backward, Ed. In my dad's day in the shop they made their own set screws, drills, taps, and everything else. We buy them all. Tom Black used to make bushings for all his drill jigs, but we've been buying them for two years, at least. It's the same with die-sets. Those who specialize in these tools have them standardized, and can make them more uniform than any shop that only makes a few during the year. And they're pretty apt to be better tools, even if Tom wouldn't admit it. I'm betting that Williams has figured out that it will be cheaper in the long run and more satisfactory in every way."

"Maybe you're right, Al, but I do hate to see work going out of the shop. I can't believe we save money buying such things.

"I don't see why any outside concern can make better tools than Tom Black's men, Al. Nor any cheaper either."

"It's dollars to doughnuts they can, Ed. Just remember that a shop that specializes on tools for a lot of different customers gets new kinks that are an improvement all around. We sort of misuse the tools we make here because Tom makes 'em. The new tools probably won't need coaxing and so will save time in the shop."

Is Ed right in feeling that a shop should be "self-contained"? Or has Al the right slant on getting standard tools from specialists? Is Tom likely to be right as to the cost?

All foremen are urged to discuss these questions vital to their work; of course the

DISCUSSION OF EARLIER TOPICS

Radio in the Shop

IN MY opinion, radio will disturb the men rather than relieve monotony. Also it will be well-nigh impossible to select a program that is acceptable to all, because the selections depend upon the broadcasting station.

Radio will interfere with the worker during periods of concentration, such as setting up or re-tooling. When the radio is playing it will need a consensus of opinion to turn it off, in spite of the fact that a particular workman may be hindered in his work by the music. Radio will therefore be annoying to the man who desires to perform a job that requires freedom from outside influences. There is enough noise in the average shop without adding the static and broadcasts of the outside world.

From a safety-first point of view noise of any description is objectionable, and should be minimized as much as possible. Constant playing of the radio will become monotonous and tiring. It will prevent reasonably low conversation between workman and foreman, and may prevent others from hearing when assistance is being asked for.

—HARRY KAUFMAN, *Public Accountant.*

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Should Workers Buy Company Stock?

A LARGE percentage of the stock of some of our most successful corporations is owned by the employees, and much of the success of the corporation is attributed to this fact. The reason is obvious. Employees owning stock in a company by which they are employed are sure to display a keener interest in their work, because they feel that they are a part of the firm. They are not so likely to consider another job and there is little danger of labor troubles, because the employees realize that labor troubles will depreciate the value of their stock. They will also co-operate with the management in eliminating waste. Many employees, who have saved some money, are glad to have the chance to invest it in the business in which they are working. It should not, however, be compulsory for employees to buy stock. The plan of deducting a certain amount from their pay is a good one, but the amount to be deducted should be decided by themselves, individually.

—W. J. OWENS, *Foreman, Newport Rolling Mill Company.*

Committees for Definite Shop Problems

THE opportunity for self-expression that is afforded by some power of control over materials, processes, and working conditions, will add to the worker's satisfaction and will utilize a powerful incentive. It will change men from unthinking workers, into a planning, creative, force.

Satisfactory results will not be obtained by this method, however, unless both the management and worker approach the plan with mutual confidence. No matter how carefully the men who are to act on a committee are chosen, or how good the plan may be, it is bound to fail if its control is placed in the hands of an executive who does not believe in it.

—R. G. GRAHAM, *Head Inspector, Advance-Rumely Company.*

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Keeping Posted on New Tools

A FOREMAN who keeps himself posted on the latest developments is bound to be better equipped for dealing with his present problems. Even if Ed doesn't believe in it, he can be sure that his competitors try and keep themselves up-to-date. Besides, is it fair to leave it all to the superintendent? Surely the latter is entitled to expect suggestions from his foreman.

Some time ago the writer was up against the problem of cutting some irregular shaped holes in the center of steel plates varying from $\frac{1}{16}$ to $\frac{1}{8}$ in. thick. The sheets were too thin to cut with the oxyacetylene process and were not required in sufficiently large quantities to justify the expense of a punch and die. For years, the method used had been to mark the outline with a template and then cut them out with a hammer and chisel. A pamphlet I received one day, from a maker of presses, showed a small nibbling press which would do the work admirably, and which has been since adopted.

It is a wise policy for any foreman to get himself on the mailing list of the leading machine tool firms, because from another angle it also has an advantage. From catalogs and price lists he gets an idea as to the cost of the equipment over which he exercises control, a feature which is surely "all to the good." Many of us have a very vague conception as to the amount of capital that is invested in the plant, and although first cost is by no means the most important thing in purchasing new equipment, it has a decided influence. Precisely the same remark applies to the purchase of small tools, and appeals for care in their use, take on a more practical aspect when one realizes their value.

—T. H. HARGRAVE, *Bolton, Lancashire, England.*

WHILE it may be Williams' job, more particularly, to keep posted on new tools, the worth-while foreman will want to be in a position to discuss them intelligently when Williams comes around, and he can do this only by reading up on his own account. Moreover, such a foreman will be the one, all other things being equal, to be marked by Williams for promotion.

In order to make a piece of equipment sell, all its

discussion is not limited to foremen. Letters accepted and published will be paid for

applications have to be thought out and written up clearly and forcefully. Its advantages over other equipment or methods have to be set forth. The consequence is, that the reading of advertising matter is an important branch of technical education whose value should not be overlooked, since the foreman who so cultivates his mind will, inevitably, be more resourceful in the solving of the problems peculiar to his calling. —JOHN ALEXANDER.
Hamilton, Ont., Canada.

OUR present system of keeping posted on new equiment is as practical as one can find. After many changes, we have brought together under one head, what we call the "Tool and Equipment Data Section." All of the various tool and machine manufacturers and those in the equipment field are requested to send in their latest catalogs and data, which are arranged in the book cases and a description of them filed in the file cabinet in alphabetical order. When the regular weekly and monthly magazines arrive, the shop equipment news and other interesting data is clipped from the pages and posted in monthly folders. The addresses of the best classes of manufacturers, together with the sales engineers' names, is carried on the files, so that when one of our engineers is seeking first hand information all that he has to do is to approach the section head who will secure it for him.

It is true that there is a certain expense connected with a bureau of this kind, but thousands of dollars are saved in the course of a year. It pays to keep posted on problems that are apt to come up and thus prevent unnecessary expense later on. The foreman who tries to gain as much knowledge about the use of tools and equipment under his jurisdiction as the superintendent has is bound to be promoted when an opening occurs.
—FRED AUGUST SCHMIDT, *Industrial Engineer, Western Electric Company, Kearny.*

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Belts, Foremen and Paper Work

IT IS agreed that the less bookkeeping a foreman has to do the better, but it is possible to carry such an idea to extremes. In my own experience as a foreman I have at times received orders to report not only on belts, but also on shaft bearings, tool steel, saws, milling cutters and other shop equipment. Having in mind the opinion that the less bookkeeping the foreman does the better, my first reaction was to rebel but further consideration told me that it was a compliment to my ability to be chosen as one who could be depended upon to compile such data, and that such an experience was bound to be useful later. The result was that in time I became enthusiastic, and eventually, when it led to promotion as engineer cost accountant, the experience gained in keeping books as a foreman became invaluable.
—J. T. TOWLSON, *London, England.*

IF WILLIAMS has had an engineering training he will naturally feel that practical men such as the foremen will be in a position to give him the information he desires better and more intelligently than a cost clerk, however good an accountant the latter may be.

Belt costs are connected intimately with their proper installation and working, there are so many factors to consider that it is true that any foreman going into the subject will certainly learn a lot that, perhaps, he never thought of before.

A consideration of all the factors that go to make a successful or economical belt drive leads one to favor Williams' appeal to men who have had a training that will make them appreciate the special knowledge and intelligence necessary to give the information requested. My own opinion is that it should be a cost department job, provided that there are engineers connected with this department who can handle this proposition intelligently. Where I am employed the department that handles this question is called the Engineering Accounting Department, and it handles all production costs, inventories, tax appraisals, and costs of an experimental nature connected with production, such as this belting discussion.
—ARTHUR FREDERICK.

* * * *

THE · NEXT · TOPIC

"A Bonus for the Ambitious"

Going Over the Super's Head

SUMMARY OF THE DISCUSSION

Black, Ed's foreman friend at the Plow Works, went over the head of his immediate superior to protest the appointment of an unwanted assistant. The general superintendent investigated Black's charges, but did not cancel the appointment. Ed defended the action of his friend, but Al said, that, while Black may have been justified, it was a dangerous thing to do and that Black had better "get a line" on another job.

NOT a single mitigating circumstance was offered to justify Black in going over the head of his immediate superior; every contributor condemned the action, and one or two censured the general superintendent for listening to his complaint. As one of them expressed it, "a general superintendent who trusted his staff would resent a foreman coming to him under such circumstances, and a concern large enough to have a general superintendent should have a well-working system of conveying information to higher officials through the proper channels." Some of the contributors considered Black merely unwise, others claimed that he showed a lack of knowledge of his job, the first principle of which was held to be not to interfere with the jobs of others. The consensus of opinion was that he should have accepted the appointee of the superintendent and have given him sufficient authority to show what he could do, then if he fell down, Black would have had concrete facts to back up his request for another assistant.

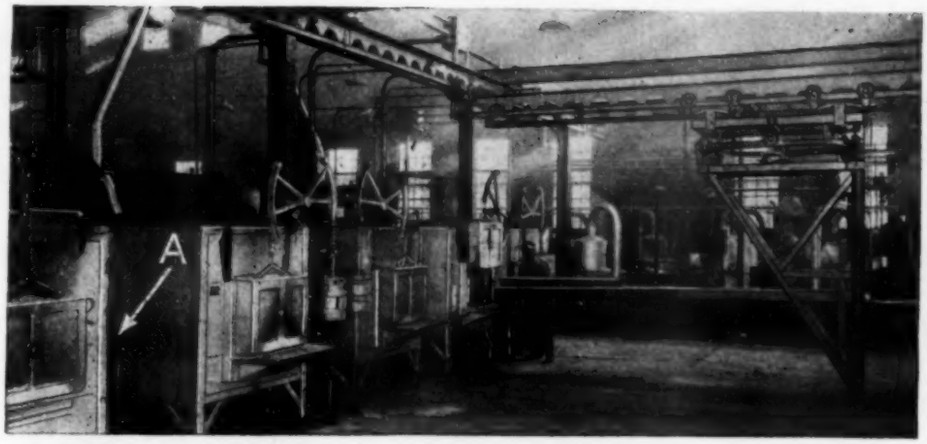


Fig. 12—Special traveling jib crane by which 8 carburizing boxes are handled at once. This crane travels the length of the room to load and unload the furnaces. It can be elevated or lowered, and also turns in a circle

Centralized Control of Heat-Treatment Processes

By Fred H. Colvin
Editor, American Machinist

Special equipment for copper plating and carburizing lightens manual labor and provides efficient control of the processes

WHAT might be termed a suspended traveling jib crane is used for charging the carburizing boxes into the furnace, and removing them afterward. This crane which is shown in Fig. 12, is universal, in that it can be moved back and forth the length of the room, toward and away from the furnaces, up and down, and can also turn in a complete circle. Its arm has a forked end that enables it to pick up two rows of four boxes each from the roller conveyor at *A*, which leads from the loading bench and deposit them in the furnace. The crane is locked automatically at any loading rack or furnace so that there can be no misalignment to damage the heating elements of the furnace or to upset the loaded boxes.

After the carburizing operation, the same crane removes the boxes from the furnace, swings the arm 180 deg., and deposits the eight boxes on one of the cooling racks shown beside the hardening machine in Fig. 13. When the boxes are sufficiently cooled they are rolled down the conveyor to the other end of the hardening machine. Here they are dumped onto the non-magnetic table shown in Fig. 14, and an electromagnet suspended from a small motor-driven crane picks the steel parts off of the bronze top and drops them through the square funnel into the box beneath. The carburizing material is drawn up through the pipe shown, cleaned, mixed with the proper amount of new material and is then ready to be drawn off as wanted from suitable pipes or chutes convenient to the packing bench.

From the separator the pieces go to the cyanide or lead pot, or to the continuous hardening furnace shown

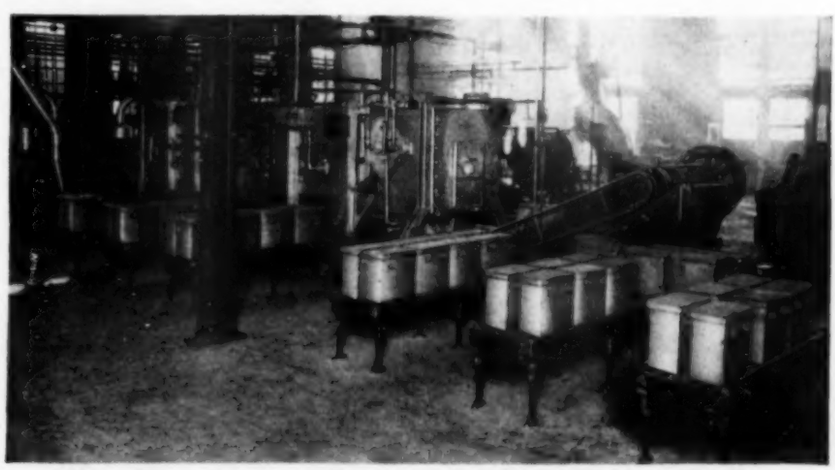


Fig. 13—Cooling racks for boxes after carburizing. From here the work is dumped and goes to the continuous hardening furnace in the background. The pieces drop into a quenching bath under the front end of the furnace

Conclusion of the article.

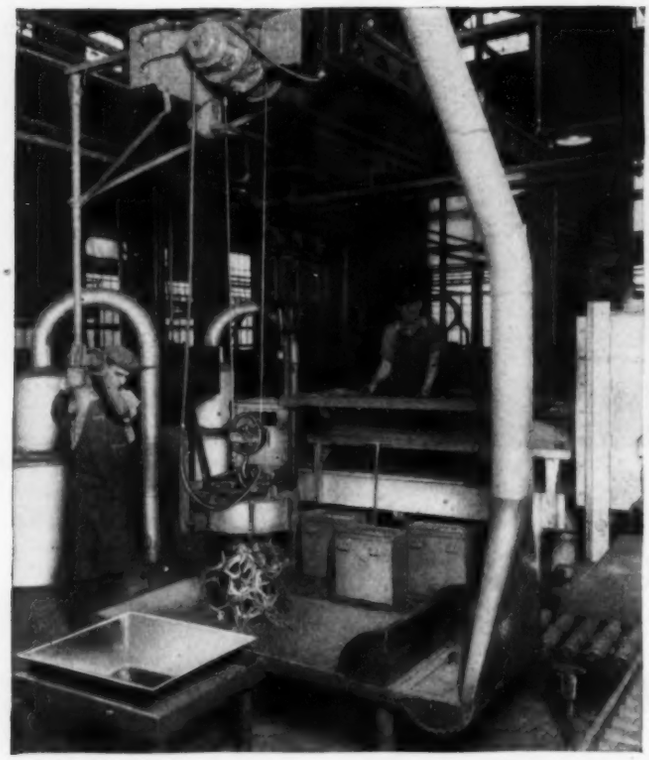


Fig. 14—Where the boxes are dumped and the work removed by an electro-magnet. The carburizing material is carried up through the pipe shown and reconditioned by the addition of new bone or other material

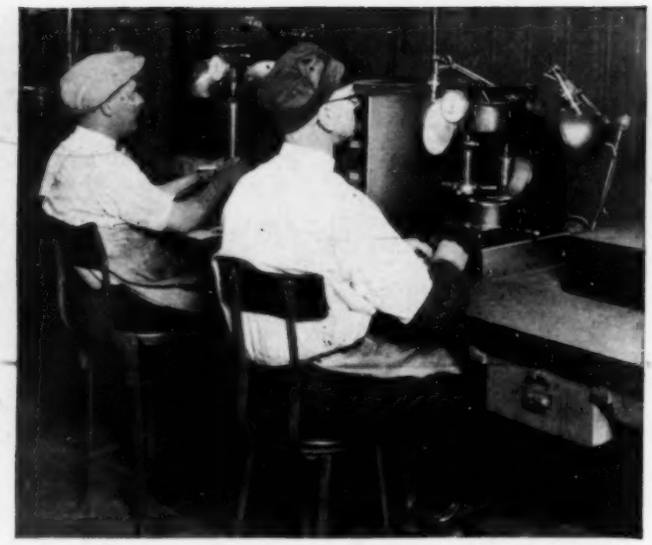


Fig. 15—Inspection bench where pieces are tested for hardness. Rockwell machines are used and a file test is also given in some cases. After inspection the work is returned to its proper department

beyond the cooling racks in Fig. 13. The furnace is gas-fired, and is loaded from the left-hand end, the pieces working their way through the furnace and dropping through a chute into the quenching bath, and upon the inclined conveyor seen at the right. This conveyor has a constantly-moving band of wire mesh to bring the pieces out of the bath and deposit them in tote boxes placed under the chute at the high end of the incline.

The hardening process is continuous, and following this, the parts, in common with those from the cyanide and lead pots, are put through a washing and drying machine. They are then inspected both with the Rockwell machines shown in Fig. 15 and also by a file, the "feel" of which, in the hands of an experienced man, is a good check on other methods in many cases. The parts are then pickled, stripped of copper plate, and replated with cadmium or nickel.

Local hardening is necessary in many of the parts that go to make up the cash register, and this presents some interesting problems for which equally interesting solutions have been found. Some of these parts are shown in Fig. 16. In these parts the contact surfaces are hardened while the rest of the piece is left soft.

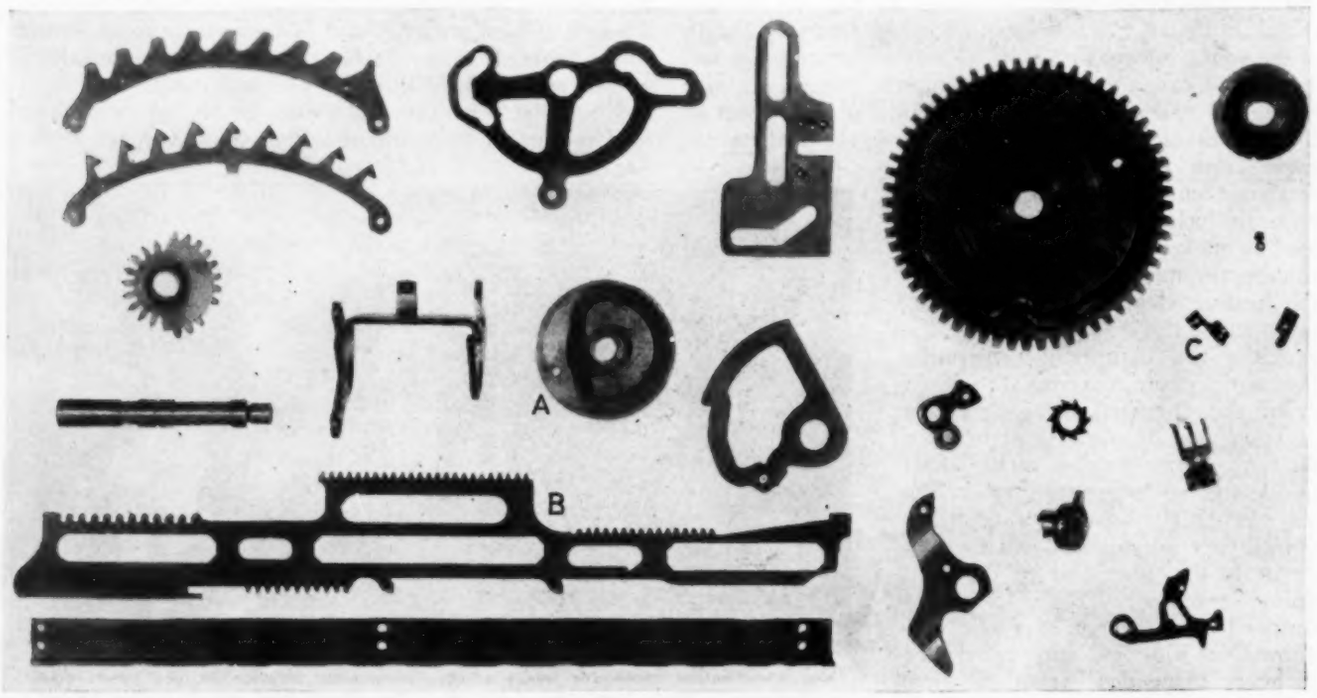


Fig. 16—Parts of cash registers which are hardened locally to provide longer life to the surfaces that make contacts

Copper plating is used in most cases to prevent penetration of carbon during the carburizing process, the pieces being plated before the surfaces that must be hardened are machined. The machining removes the copper and permits the exposed surfaces to be carburized in the usual way. In several of the pieces shown, the surfaces to be hardened are obvious, such as the gear and rack teeth, and the cam cut in the side of the disk *A* in Fig. 16, which is the same piece as illustrated in Fig. 3 in the previous article.

Several interesting plating methods have been developed to handle special pieces, one for small work being shown in Fig. 17. Here the pieces are placed in shallow trays, made to suit the particular work to be done, and are arranged so that only the part to be hardened is exposed above the plate in the tray. A special bronze powder is spread over the top of the work, covering the ends that project above the plate. The trays are then suspended in the copper plating bath by means of the hooks shown, and the bronze powder prevents the copper plate from depositing on the parts protected by it and leaves them free for hardening.

Another method of copper plating is shown in Fig. 18. The work is placed in perforated tumbling barrels which revolve during the plating process. This obviates the necessity of wiring each piece separately, as the tumbling insures the copper solution reaching all surfaces of the various pieces and giving them the desired deposit. The thickness of the copper plating is checked in an ingenious manner. Experiments have shown that a 50-50 solution of nitric acid will eat through a copper plating deposit of 0.0001 in. in ten seconds. As it has been found that a plating 0.0005 in. thick works out well for protection against hardening, the plate must withstand the test for 50 seconds, before the acid eats through it to the steel.

Fig. 17—A method of securing local hardening of small parts by preventing copper plate adhering to the portions to be hardened. The work is packed in trays and the parts to be hardened are covered with bronze powder

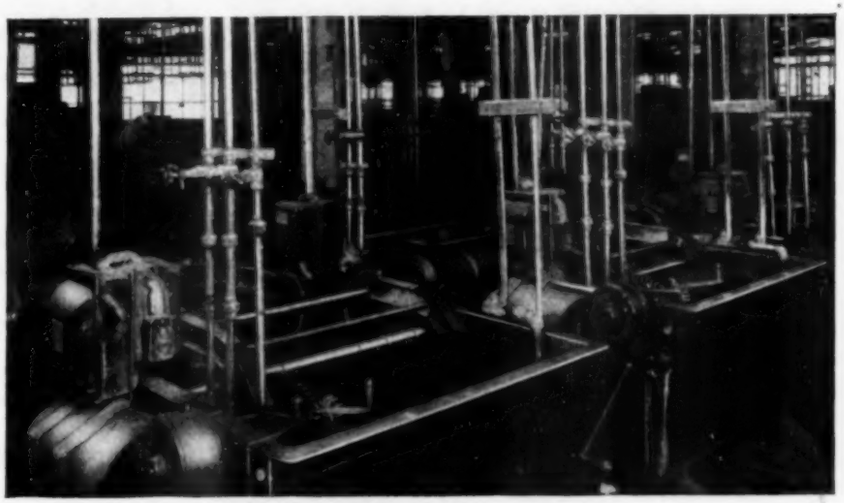


Fig. 18—Copper-plating by the tumbling method. Instead of wiring each part and hanging it in the copper-plating bath the pieces are revolved in the perforated barrels partially submerged in the copper solution

Fig. 19—Local hardening with oxy-acetylene torches

Certain delicate parts of the machines requiring local hardening are treated by special methods. These do not go to the hardening machine, but are heated in either lead or cyanide as has been found best suited to the work. Others are heated locally by either the oxy-acetylene torch or the electrodes of a spot welder. These methods are shown in Figs. 19 and 20 respectively. The first shows three torches clamped to a fixture in such positions that one or more of them will heat the racks *D* at the desired points. The racks are then quenched in a convenient tank. The colored screen *E*, which is permanently in place, protects the operator's eyes without the necessity of wearing colored glasses. This torch method is used only where a mild casehardening is desired on parts that are too intricate to be heated in a cyanide bath or packed in pots for carburizing. A very rich flame is used, which carburizes and nitrogenizes very little surface other than

Fig. 20—Another method of local hardening in which the spot welder is used for heating the portion to be hardened. After the piece between the electrodes is heated the treadle is released and the piece slides into the water

the area heated. This area will harden when quenched.

Another piece is being hardened locally on the spot welder shown in Fig. 20. Here the operator simply places the piece between the electrodes and presses the foot lever. As soon as the current has heated the portion between the contact points sufficiently the operator releases the lever, the upper electrode rises and the hot piece slides down the piece of sheet metal and into the bucket of water. The heating is so rapid and so localized that a hole is drilled in the piece, near the hardened portion after it comes from the quenching bath.

Fig. 21—Double hardening press with the rams hydraulically operated. The heated piece is placed on the lower disk, the upper disk comes down and holds it flat while it is submerged in the cooling liquid beneath

Another special device used in this department is the hardening press shown in Fig. 21. This is a hydraulically-operated press with two perforated plates for holding pieces flat while they are being quenched. The heated piece is laid on the lower plate, and a foot control lowers the upper plate and holds the piece flat while it is lowered into the quenching medium beneath. As the plates come together oil is forced through the perforations in the plate. A double set of plates permits hardening as rapidly as the pieces can be handled from the furnace. The cleaning of the plates and the ejecting of the work is done automatically.

Congestion at the Machine Tools
Discussion

By R. G. Hewitt
Yorkshire, England

IN AN article under the above heading on page 734, Vol. 70 of the *American Machinist,* J. T. Saville laments the increasing progress of machining instead of fitting in Great Britain. May I suggest that this is really an indication of progress and that the more fully it is carried out the more efficient will the industry become. The whole secret of mass production lies in having the machines do the work.

The difficulty that Mr. Saville has seems to be that the machine shop is not large enough to cope with the erecting department. This could be remedied by adding more machines to the plant. Filing keyways in hand-wheels may prevent fitters from waiting on the machine shop, but it seems like pushing the clock of progress back 50 years. The days when a fitter spent his time in filing, chipping, and scraping are gone. In fact, in modern industry the name "fitter" does not mean anything definite. A much better name in my opinion would be erector. It is only logical that as time evolves machines that increase in accuracy and output, the work of the old fashioned fitter will be displaced gradually and possibly in the future we shall have someone lamenting the fact that erectors do not know the use of a file.

Put Salvage Up to a Committee

By S. Kupper

IT IS almost as important to provide some orderly and responsible method for the disposal of waste material as it is to hold waste down to the minimum.

The best method is to have some form of salvaging committee which shall represent the purchasing department, the engineering department, the shop, and the storekeeper. This committee should go over all waste and obsolete materials at regular intervals. This should be done, first, to see if the material can be used, as it stands, for some other order; second, to see if it can be used by reworking, such as cutting down to a smaller size; third, to find the best market for it; and, fourth, to increase its salvage value by such means as sorting or baling.

In this connection, the purchasing department can usually render effective aid. Great savings may often be realized by giving the problem of salvage the attention which it deserves.

IDEAS FROM PRACTICAL MEN

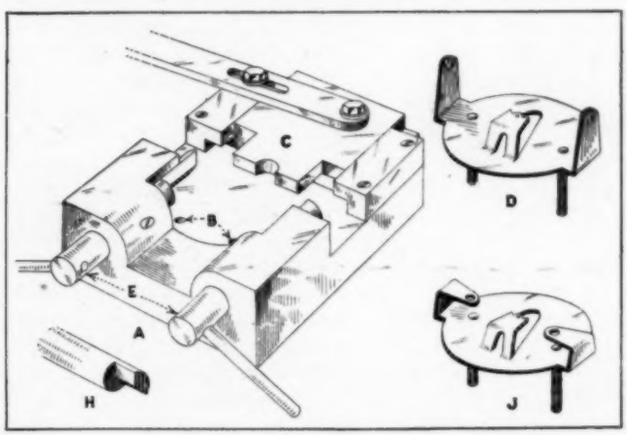
The department, "IDEAS FROM PRACTICAL MEN," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit.

A Bending Fixture

By CHARLES H. WILLEY
Assistant Plant Superintendent, Hoyt Electric Works

During the process of assembling certain parts of ammeters for automobiles, it is sometimes necessary to perform a bending operation after some of the parts have been put together. In one type of ammeter it is necessary to bend the dial supports after the coil and the terminal screws have been put in place.

The partly-assembled ammeter is put into the bending fixture *A*, locating it by the terminal screws, which enter



Bending fixture for ammeter parts

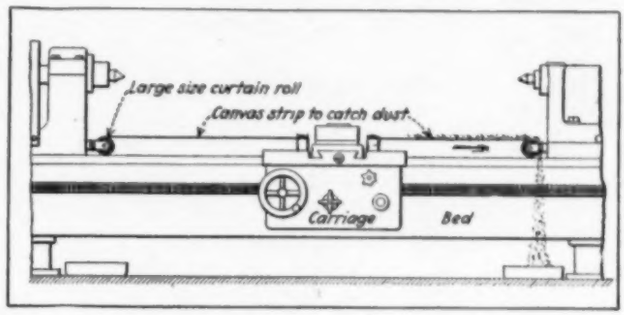
the holes *B*. The slide *C* is brought forward by the lever at the rear, and enters between the vertical members *D*. The two shafts *E*, having their inner ends formed as at *H*, are rotated in opposite directions, bending the vertical members at right angles, as shown at *J*, and forming supports for the dial of the meter.

Protecting the Ways of a Lathe

By F. M. LITTELL
F. J. Littell Machine Company

We have had occasion from time to time to grind rubber rotogravure rolls in one of our long lathes. In the past the fine rubber dust has settled on the ways, much to the detriment of the lathe. An exhaust system might have cured the condition, but the less expensive method of doing the trick, as shown in the illustration, was found to be satisfactory.

Two sheets of canvas a little wider than the ways of the lathe, and of the same length as the travel of the carriage were purchased, already mounted upon heavy curtain rolls. One roll was attached to the headstock and the other to the tailstock, while the end of each length of fabric was hooked to the carriage. The result



Canvas strips on spring rolls for protecting the ways of the lathe

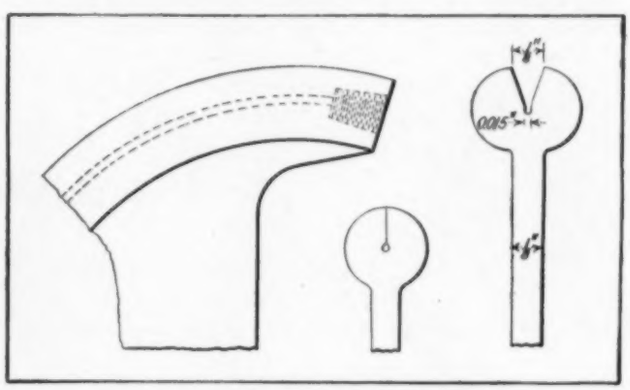
is that the dust settles on the cloth and is dumped as the canvas passes over the roll. This scheme should prove useful when turning or grinding unusual material in a lathe.

Milling a Curved Hole

By H. L. FRANCIS

The engineering department of a plant manufacturing refrigerating apparatus was in a quandary as to how the refrigerant could be led from the condenser coils to the expansion coils. The space was too limited to admit of jointed pipe, and too cramped to permit brazing a tube after assembly. The hole was to act as an expansion nozzle with an aperture of 0.01 in. The longer the hole the more uniform the rate of expansion would be.

Finally the problem was sent to the shop. After a consultation it was decided that the best design was to make a curved hole in the edge of the coil end plate, which was made of steel. As it was not necessary for the hole to be exactly round, it was decided that a milled hole would be satisfactory. The illustration shows how



Groove milled in a curved surface and closed in to make a curved hole

the work was done. As can be seen, a V-shaped groove with a U-shaped bottom was milled in the sector plate on a radius slightly larger than that of the coil, and then the sides of the V were brought together. The first pieces made were brazed to prevent leakage, but as the work progressed it was found unnecessary to do so.

It was determined that if a truly round hole were desired, the hole formed as described above could be reamed with a long wire slightly smaller in diameter than the final hole size and with a reamer tool formed on the upset end.

Producing a Curved Hole

By Morton Schwam

Quite often the occasion arises where the engineering department would like to specify a curved hole through a solid block of metal of substantial proportions, but they usually dismiss the thought as a much desired impossibility.

The illustrations show that this can be done with almost any size bar where the hole is not so large that

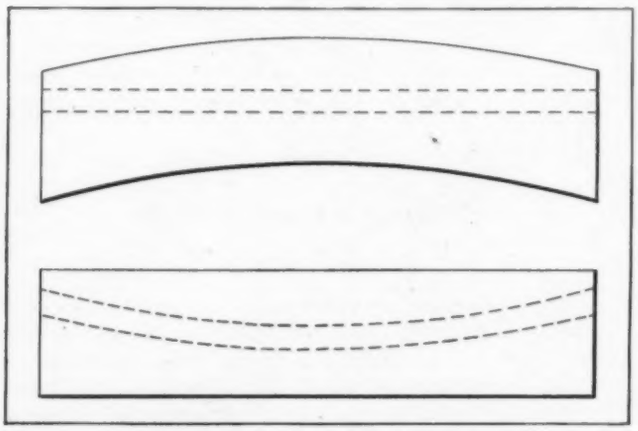


Fig. 1—A simple method of obtaining a drilled and reamed curved hole

it will become distorted during the straightening. The first step is to bend the piece to be drilled to the desired finished shape of the hole, and then drill a straight hole through it as shown at *A* in Fig. 1. It is evident that various types can be made this way.

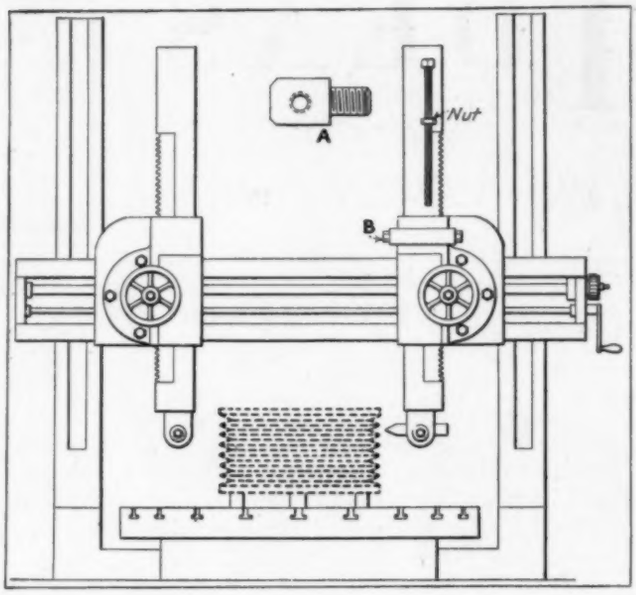
The piece can then be straightened cold, with the hole packed with sand, lead, or resin, depending upon the nature of the metal used. It may be straightened hot if quite large. There is no more likelihood of the hole collapsing in this form than there is in bending a piece of pipe, because the wall is thick enough to stand the strain.

Spacing Gage for a Vertical Boring Mill

By H. K. Griggs

Having to turn grooves $\frac{3}{4}$ in. apart in a lot of friction gears, I rigged up a spacing gage on the vertical boring mill in which the work was done. The sketch illustrates the device.

A shanked nut, as shown at *A*, was screwed into a hole drilled and tapped in the boring bar, and a long screw was threaded through it. A stop for the screw



Spacing device for a boring mill

was attached to the quill of the machine, as shown at *B*. While the screw was in the lathe, a fine line running lengthwise of the screw was scribed on the tops of the threads. A line was also scribed on top of the nut. By means of these lines, whole revolutions of the screw could be accurately counted.

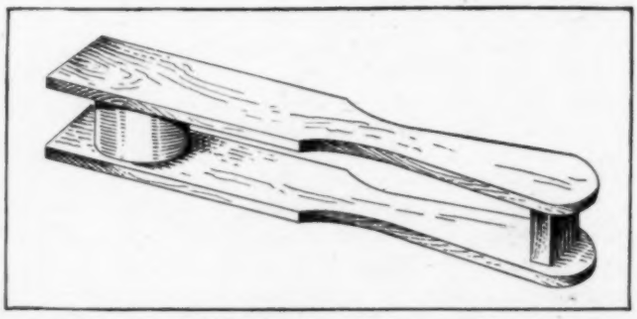
In cutting the first groove, the lines on the screw and the nut were brought into coincidence and the tool was adjusted to the proper height by raising or lowering the crossrail. For each succeeding groove, the screw was backed out of the nut three full turns and the bar was lowered until the screw abutted against the stop. Three tools were used in cutting the grooves a parting tool to remove some of the stock; a roughing tool; and a finishing tool. By the use of this device, the work was done in quicker time and much more accurately than if scale measurement had been depended upon for the spacing.

Reclaiming Oversize Bushings

By Don R. Hammitt

Chief Engineer, Portland Forge & Foundry Company

Sometimes the bores of jig bushings are ground, or lapped, oversize. Or they may become oversize in the hardening process. To make the holes smaller, providing they are not excessively oversize, heat each bushing to the standard hardening heat and place it on a softwood board, covering it with another board, as shown



Boards for holding bushings in the quenching bath

in the sketch. Hold the bushing in place and quench it in the cooling bath, keeping it submerged until cold.

Upon removal from the bath, the bore will be found to be smaller, due to the cooling and contraction of the outside, as the bath can not reach the inside. The bushing may now be drawn to suit the requirements, and then ground or lapped to size.

Pneumatic Helper for Heavy Fitting

By R. C. Heinmiller

When fitting the head of multiple-spindle drilling machines and cylinder boring machines to the upright or column, a great deal of manual exertion is required to move the head back and forth on the ways of the upright. If the caps or straps are being fitted, still more power is required to move the head back and forth in order to see where scraping and fitting is necessary. Some of these heads weigh over 3,000 lb., and it is therefore apparent that the work is slow and tiring unless some form of mechanical help is available.

Formerly, it was necessary for the men to take a piece of 2x4 in. lumber and pry first on one end and then on the other, to move the head back and forth along the ways. Because it was slow and exhausting it became almost imperative that some kind of a mechanical device be developed to relieve the men of this tedious work. The contrivance shown in Fig. 1 was developed for this purpose, at a small expense, and has solved the problem. In building this we purchased what is known as a double-acting, double-ended, bracketed air hoist. This hoist has a stroke of 3 ft., and a piston diameter of 7 in. An old drilling machine column was utilized and the air cylinder was mounted on a slide which was fitted to the column in the same manner as the head had been formerly. The slide carrying the cylinder was counterweighted, so that it could be raised and lowered easily. Leveling screws were placed at the four corners of the base to take care of uneven floor conditions, and a bale was fastened at the top so that the whole mechanism could be moved with a crane.

The operation of the device is simple. In setting it up for any job, the workman connects one end of the piston rod to the head he is fitting and also fastens the upright to which the head is being fitted, with another tie rod. All he has to do to move the head back and forth on the ways is to operate the valve lever, the air cylinder does the heavy work. By making the valve manually operated instead of automatic, the operator has control of the speed and length of stroke, without spending a lot of time in setting stops and valves.

The double-ended hoist was used in order to provide an additional bearing for the piston rod. It also makes it possible for two crews to use the device at the same time, as has been done in a number of instances. Through the use of this pneumatic device it has been possible to save from $\frac{1}{3}$ to $\frac{1}{2}$ the time required for fitting by the old method.

A Milling Fixture and a Flush-Pin Gage

By A. Becker

The type wheel shown in Fig. 1 at *A*, is a small gear having characters engraved upon it. It is sweated to one end of a brass sleeve, the other end of which is to be straddle milled so as to leave a tongue. The

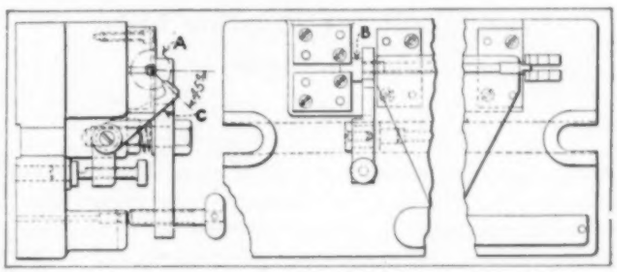
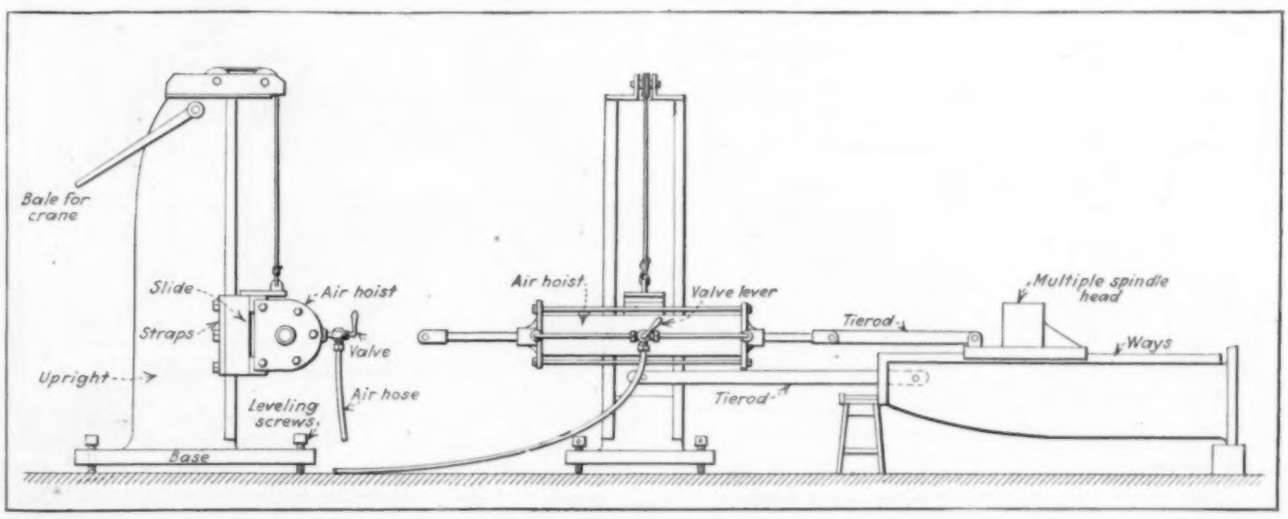


Fig. 1—Fixture for straddle milling

mandrel *B* is put through the sleeve to prevent it from being crushed when clamped in the fixture. The assembly is angularly located in the fixture from one of the tooth spaces of the gear by the pawl *C* being placed in it.

For testing the accuracy of the tongue in angular relation to the particular tooth space, the assembly is put into the gaging fixture shown in Fig. 2. The tongue



Double-ended air hoist mounted upon the column of an old machine, used as a mechanical helper in scraping and fitting heavy parts. Leveling screws are provided at the four corners of the base

fits between two hardened plates. The pivoted arm *D*, carrying a disk machined to fit the tooth spaces of the gear and mounted on a flush pin, is swung into such position that the formed disk enters the particular

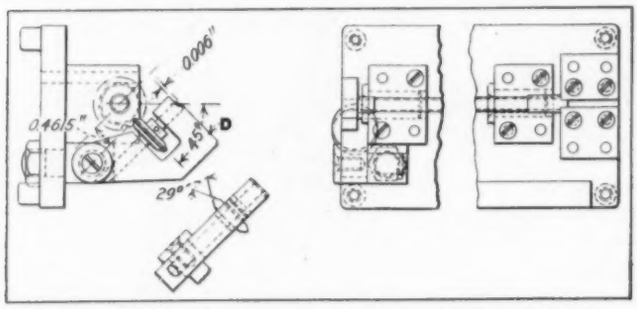


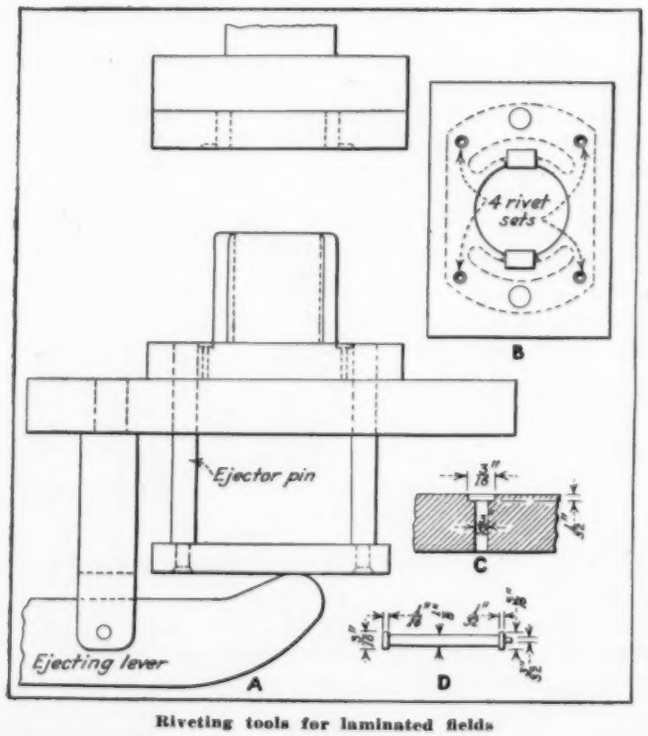
Fig. 2—Gaging fixture to show angular relation of tongue to a certain tooth space

tooth space from which the tongue is angularly located. When the disk is in mesh with the gear, if either of the steps on the flush pin are flush with the end of the arm, then the tongue and that particular tooth space are in proper angular relation with each other.

Press Tools for Riveting Field Laminations

By Frank Browett
Triangle Tool & Die Company

Some time ago I made the press tools shown in the illustration for riveting the laminations for motor fields. The punch and the die are shown in elevation at *A*. A plan of the die is shown at *B*, while at *C* and *D* are



Riveting tools for laminated fields

shown an enlarged section of part of the die, illustrating one of the rivet sets, and a rivet after being headed.

The die is merely a round stake set upon a plate in which are four rivet sets. Two longitudinal tongues on the stake, one on each side, match the slots radiating from the central hole in the field, their purpose being to align the laminations. The lower ends of the ejector pins are attached to a plate, so that the pins will move in unison. Since the ejector pins must be in their lowest position when the laminations are put in place for riveting, they cannot be operated by springs. Therefore, they are operated by a hand lever, the toe of which rests against the under side of the plate that holds them.

The proper number of laminations are wired together and are brought to the press in that condition. After stripping off the wires, the laminations are put over the stake and four rivets are put in the holes far enough to make sure that they will stand up in line with the holes. When the press is tripped, the punch forces the rivets through the holes and down into the rivet sets. Also, the laminations are squeezed tightly together.

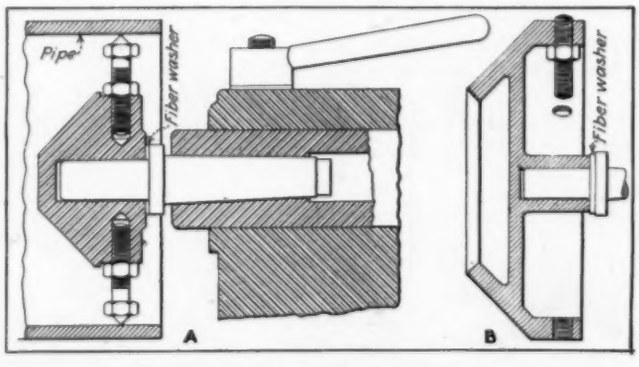
What happens to the lower ends of the rivets is the secret of success of the tools. The lower ends of the $\frac{1}{8}$-in. rivets hit the sharp corners of the $\frac{3}{32}$-in. holes at the bottom of the rivet sets, and the outer surfaces are cut and curled up until the cavities of the rivet sets are filled, thus forming heads. The advantage of this method of forming the rivet heads is that actual riveting does not take place until after the laminations have been squeezed together so tightly that there is no possibility of any of them being loose. Also, the rivets are not upset in the holes of the first two or three laminations in the pile, as is the case in hand riveting. As the riveted fields are pushed off of the stake by the ejector pins, they drop into a box at the back of the inclined press.

Combined Center and Spider for Pipe

By E. J. Jordan

While neither centers nor spiders for supporting the outboard ends of pipe in the lathe are new, the combined center and spider shown in the illustration presents rather a novelty. Pipe up to certain diameters can be carried on the conical part of the center in the usual manner, while larger pipe can be mounted on the part that forms the spider.

The device can be made either as shown at *A* or *B*,



Combined center and spider for pipe

according to the size of the pipe to be held. It revolves on a plain shank held in the tailstock spindle and the thrust is taken by a fiber washer. Where the device is in constant use, it might be better to replace the fiber washer by either a ball or a roller bearing of the type designed for both thrust and radial loads.

Typical Die Sets

Continued from Sheet No. 18

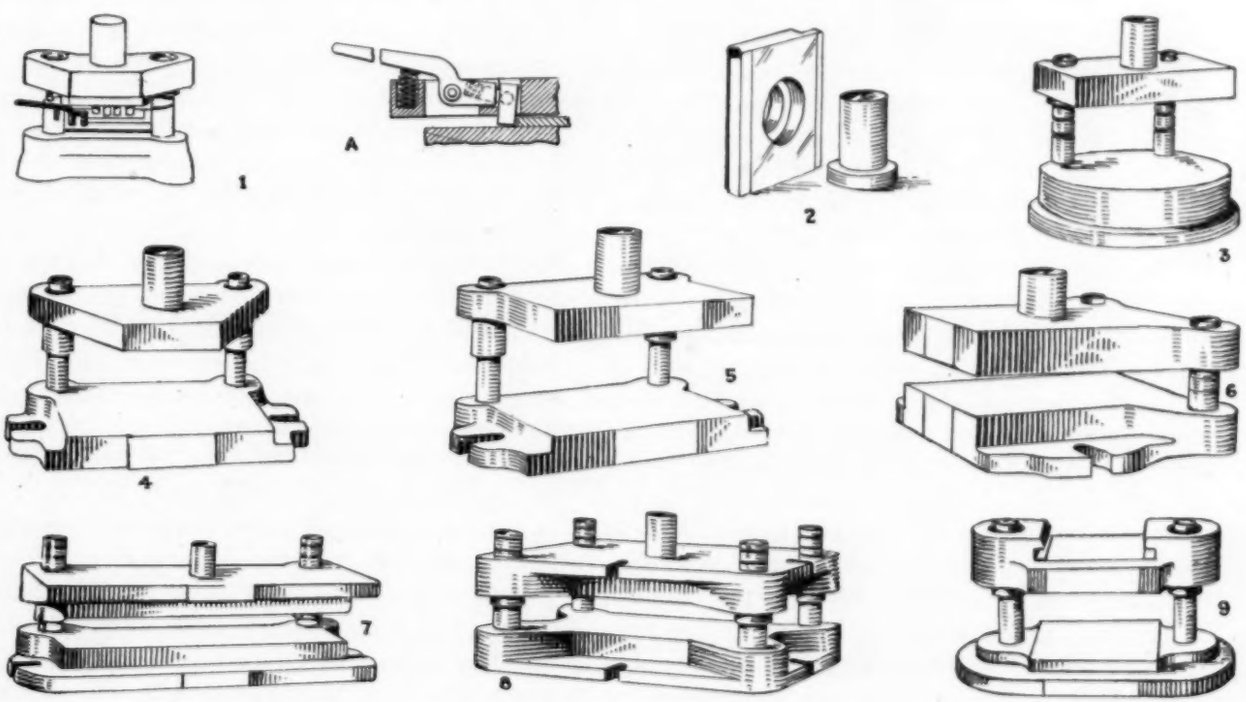
Many manufacturers who no longer make their own twist drills and small tools continue to make their own die sets and similar equipment. Much of this class of shop equipment has been standardized, and it is the intent of these sheets to supply the tool designer and other interested parties with condensed information as to the commercial types which are available. No attempt is made to catalog all of the types and sizes produced by any one maker, but simply to give to the designer a working basis to avoid unnecessary duplication of equipment and parts available on the market.

In Fig. 1, detail at *A*, is shown an automatic stock stop for any die set. Fig. 2 shows a swivel adapter for floating adapter die sets. A round die set provided with clamping surface around the full circumference of the die shoe so that the set may be easily clamped in any position is shown in Fig. 3. A similar type has a slotted die shoe.

In Fig. 4 is shown a die set that is recommended for dies having small punch pads. The V-construction enables the operator to see into the die. It is available with light or heavy die shoes and light or heavy V-punch holder. Fig. 5 shows a type recommended for average press work where the shut height of the press is limited, the thin die shoe and punch holder allowing maximum height of die and maximum ease of assembly. Similar types are supplied with heavy die shoes for heavy press work or where room must be provided in a lower chamber for pressure pads or other moving members; or with heavy punch holders where room for springs or other moving parts is desired in an upper chamber. Reverse die sets, one of which is shown in Fig. 6, in which the depth of die space is greater than the width, are available in all types shown.

A long narrow die set recommended for progressive dies or for long narrow parts is shown in Fig. 7. The four-pin die set (Fig. 8) is recommended for large dies requiring spaces from 9x15 in. to 18x18 in. Four leader pins are recommended for these large sets to eliminate overhang. Pins of different diameters prevent punch holder being accidently turned to wrong position.

Fig. 9 shows a floating adapter die set for dies doing precise work, such as parts for adding machines. The floating adapter also relieves the die set from any strains induced by inaccuracies of the punch press. When the shut height of the press does not allow the floating type adapter to be used, a special center-pin type is provided for precision work.



Courtesy Danley Machine Specialties, Inc.

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American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Vol. 71 New York, August 1, 1929 No. 5

Metal in Aircraft Construction

REPORTS of the increasing use of metal in airplane construction continue, bearing out frequent predictions of careful observers in the past. Alloy steels as well as alloys of the lighter metals with aluminum as a base are in greater demand than ever before in the aircraft field.

Heat-treatment is also becoming increasingly important in all the metals used, making a much larger field for equipment that can handle the larger units likely to appear in the near future. More metal-working machinery is going to be required by the aircraft industry, and the plants that study the needs of the plane builders who are using metal construction will be in position to meet the demands as they appear. The aircraft industry bids fair to follow the automobile as a stimulus in developing new materials, new machine equipment, and new methods.

*

Labor Shortage in France

A RECENT report from France is that the industrial plants are having trouble now in getting the workers they need to meet their production schedules, and are fearful of serious difficulties if agricultural demands for harvest labor lead to a general return to the land.

It is hard for us over here to understand why the French employer is so steadfast in his resistance to the introduction of modern production machinery when it would settle his current worries in short order. We still have a few backward labor unions that are fighting mechanization of their trades but our manufacturers are pretty generally willing to admit the soundness of the use of machinery to replace human labor. There is some excuse for the man who sees his job vanishing because of a machine and faces the problem of learning a new trade or beginning life over again because of an economic readjustment. He is up against hard facts and may be forgiven for not realizing that the introduction of the machine will be for the best interests of all, in the long run.

But why an employer who is short of help should object to filling the gap with machinery that would inevitably reduce his production costs is a poser. To us it seems that the French manufacturer needs to be educated, but perhaps the shoe is on the other foot in that we do not understand his troubles. There is just this to be said for our point of view—we have proved by trial that mechanization works under our conditions.

*

Training Successors to a Genius

THE plan that is under way to train a boy from each state along lines that will make it possible to select from among the forty-eight a worthy successor to Thomas A. Edison is both novel and praiseworthy. As the success or failure of the endeavor cannot be determined for several years, probably a decade, all comments are more or less in the nature of predictions, which are always dangerous. There are, however, a few basic points to be considered in order that we may not expect too much and that any disappointment may not lead to undue pessimism as to the future.

A little consideration will show that growing up with an industry is a very different matter from entering it after it has emerged from its early struggles into a stable and ever-expanding business. Those who grow up with a new business absorb something from the many difficulties encountered that gives them a background which no new man can hope to acquire. The pioneers may have advanced by crude, cut-and-try methods instead of by scientific and logical research, but they are apt to have a versatility that is valuable and difficult to duplicate.

There is no reason to believe that there will not be a number of boys from among the forty eight who will be brilliant additions to the electrical industry. They may produce inventions that will revolutionize our modern ideas of electricity. They may even find out what electricity really is. But it is doubtful if any one of them will ever become another individual Edison. This is an age of specialization and we may expect to see experts in each line rather than a single genius.

Only in a new industry do we seem to find the outstanding genius. But because of this we should not deceive ourselves into believing that the new generation is inferior to the old. It carries on under different conditions, and usually with greater success.

South Bend "New Model" Toolroom Precision Lathe

THE "New Model" toolroom precision lathe manufactured by the South Bend Lathe Works, South Bend, Ind., has been developed for work such as the production of master taps, thread gages, special screws, dies, fixtures, tools and similar products. The lathe is built in the 11- to 18-in. sizes inclusive, in several different designs, including countershaft-drive and motor-drive types, and with either the straight or gap beds.

Wide Threading Range Supplied

The quick-change gearbox provides 48 changes for cutting right- or left-hand standard screw threads from 2 to 112 per in. It also provides for various adjustments of automatic cross feeds and automatic longitudinal feeds. No gears are removed in obtaining this range of screw threads nor in adjusting the feeds.

The lathe bed is made of close-grain cast iron containing 18 per cent steel to give strength and wearing qualities. It is reinforced by box braces cast in at short intervals. The bed has three V-ways and one flat-way for aligning the carriage, headstock and tailstock.

The headstock unit is equipped with a quick-acting reverse lever for changing the direction of the automatic feeds. A quick-acting bull-gear clamp permits engaging or disengaging the back gears without the use of a wrench. A four-step spindle cone is used on lathes of the 13-in. size and larger, and a three-step cone on the smaller sizes. The cone pulley and bull gear are accurately balanced so that the lathe can be operated at high speed with the open belt on the smaller steps of the cone for finishing cuts, drilling, polishing, machining brass and aluminum, and other work, without danger of vibration. The larger steps on the cone provide intermediate speeds for general work. The back gears furnish slow speeds and power required for the heaviest roughing cuts.

The headstock spindle is made of special-quality carbon spindle steel and has a hole through its entire length for machining rods and bars through the lathe chuck and draw-in collet chuck. The spindle bearings are ground and are seated in phosphor-bronze boxes.

The tailstock has a long bearing on the lathe bed. A set-over is provided for taper turning. It allows the compound rest to swivel parallel to the bed. The tailstock spindle is graduated in 16ths of an inch.

The carriage has a wide bridge and long bearings on the V-ways of the bed. On the 13-in. and larger sizes there are T-slots for clamping work for boring and reaming. The cross-feed screw has an Acme thread and a micrometer graduated collar reading in 0.001 in. A locking device fastens the carriage to the bed when using the cross feed.

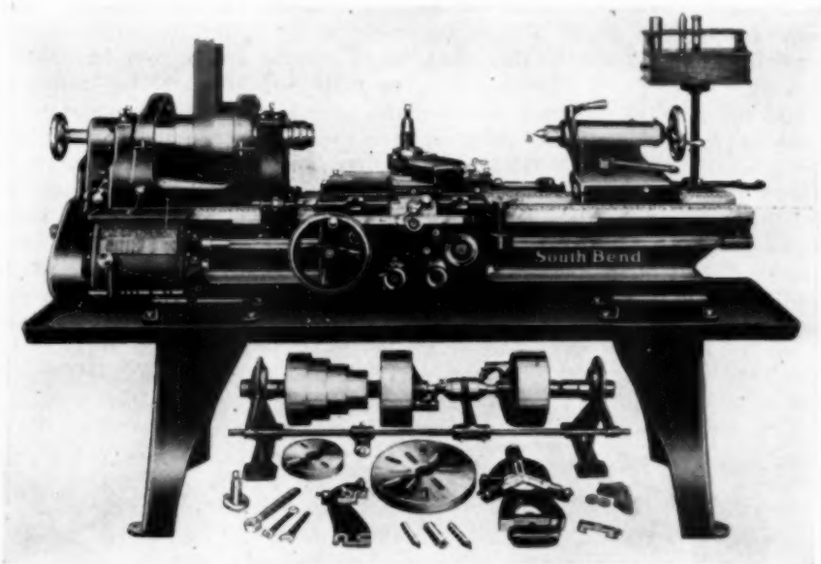
The apron is provided with automatic friction cross feed and automatic friction longitudinal feed. A double bracket supports the steel feed-worm. An automatic safety interlock prevents the half-nuts and automatic feeds from being engaged at the same time. The half-nuts are used for screw thread cutting only.

The precision lead screw is made of special steel and has Acme thread. It is splined, which enables it to serve as a feed rod for operating the automatic friction cross and longitudinal feeds. The threads of the lead screw are used only for cutting screw threads.

The compound rest is graduated in degrees from 0 to 90 from the center to each extremity of the arc. It swivels on a central stud, can be clamped and operated at any angle, and has an angular travel. The compound screw rest has Acme thread and a micrometer collar graduated in 0.001 inch.

The double friction countershaft may be arranged as a two-speed countershaft by using a pulley of large diameter on the line shaft to drive the friction pulley regularly used for the reverse. Sixteen spindle speeds are thus provided, the high speeds being suitable for machining brass, bronze, aluminum and similar material.

The oiling system for the spindle bearings consists of an oil cup which feeds the lubricant down and around the inside upper half of the bronze bearing. Small squares are milled out of the lower half of the bearing at the point where it meets the upper half. Through these milled sec-



South Bend "New Model" Toolroom Precision Lathe

tions wick tapers carry and hold the oil.

An important attachment for these lathes is the draw-in collet chuck attachment. The split collet is hardened and tempered, and ground inside and outside. It is used for the manufacture of small precision parts for watches, typewriters, sewing machines, adding machines, radios, and similar products. Bars and rods may be passed through the $1\frac{3}{8}$ in. hole in the spindle and held in the chuck for machining. The hand-wheel type of the draw-in collet attachment is used for making small tools and parts. The spindle-nose collet chuck is designed for use with larger sizes of collets than can be used with the hand-wheel type.

Producto No. 11D Double-Spindle Cam Milling Machine

TWO cams in any size up to 8 in. in diameter and 4 in. in width can be milled simultaneously on the No 11D cam miller developed by the Producto Machine Company, Bridgeport, Conn. This is made possible by means of the two work spindles on the machine shown in Fig. 1. Although the machine was originally developed to mill $\frac{3}{16}$ in. of stock from automobile brake expanding cams, it is not limited to this class of work.

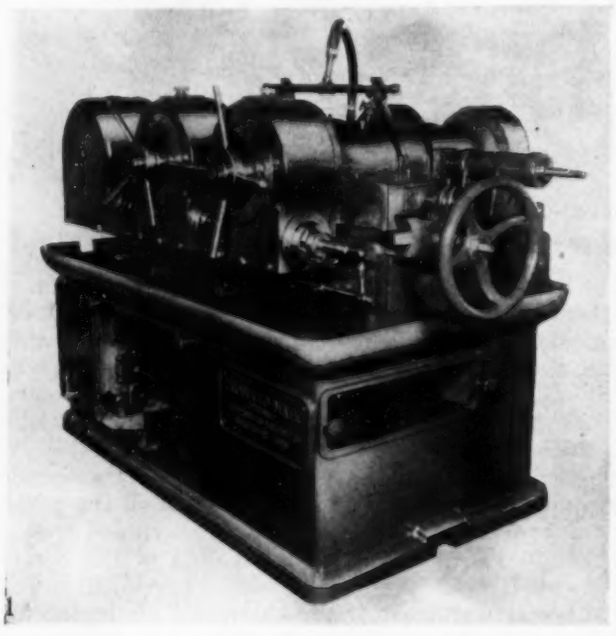
The machine is mounted on the standard-type cabinet base used on the company's line of "Producto-Matic" milling machines. The bed is bolted securely to the base and carries a dove-tail slide *A*, which in turn carries the double cutter-spindle head *B*. This cutter head is a one-piece casting. The double heads on the left-hand side of Fig. 2, contain the bearings for the two work spindles. The large housing at the rear of the machine covers the worm drive to the camshaft. Two separate castings are employed for the work spindle heads and adjustment between these heads provides for wear on the cutters.

To operate the machine, the hand-wheel *C* is turned to withdraw the work spindle head from the cutters so that the work can be loaded in the spring collets. The capstans *E* are used to tighten the work in the collets. In addition, the work is located properly in relation to the cutters by small templates *D*. These templates slide out of the way automatically when the machine is in operation. After the operator brings the work head into the milling position, a feed lever *G* is thrown in and the automatic feed operates.

The cutter spindle heads travel back and forth in the large dove-tail slide, these movements being controlled by a master cam *H*. A roller mounted in a bracket at the rear end of the double cutter spindle follows in the path of the master cam and the proper tension is applied by a spring in the housing *J*. Flywheels on the cutter spindles provide smooth cutting action. Large diameter cutter and work spindles are employed, these being $3\frac{1}{2}$ and 6 in., respectively. This heavy design prevents chatter.

Another feature of the machine is the provision of means for milling the master cam from a model of the work. In place of the cutters in the cutter spindles, hardened rolls are substituted, and these follow the contour of the models. Cutting of the master cam is done by a cutter used on the rear of the cutter spindle in place of the usual roller. The tension is applied to the work head so that the roller follows the model. The cam is taken off the camshaft by sliding off the outboard supporting bracket.

The cutter spindle heads can be adjusted sideways through 4 in. to provide for different widths of work. The work and cutter spindles are mounted in Timken roller bearings. A $7\frac{1}{2}$-hp. motor is used to drive the machine. Net weight is 6,000 pounds.



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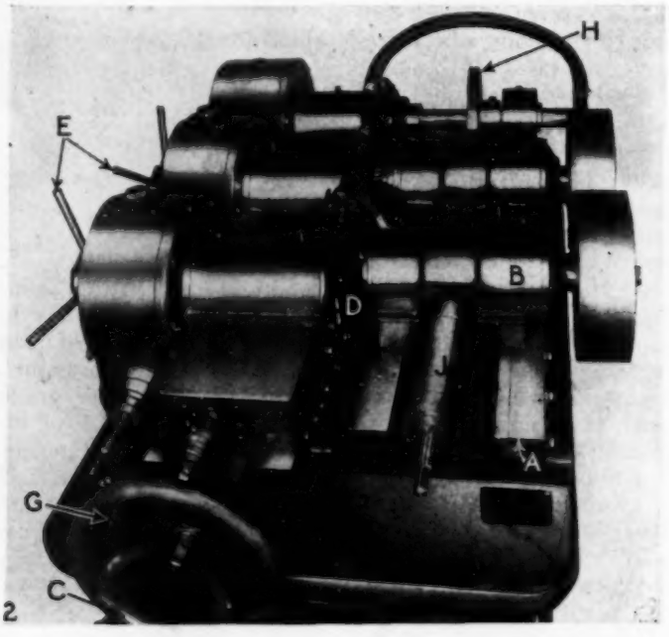

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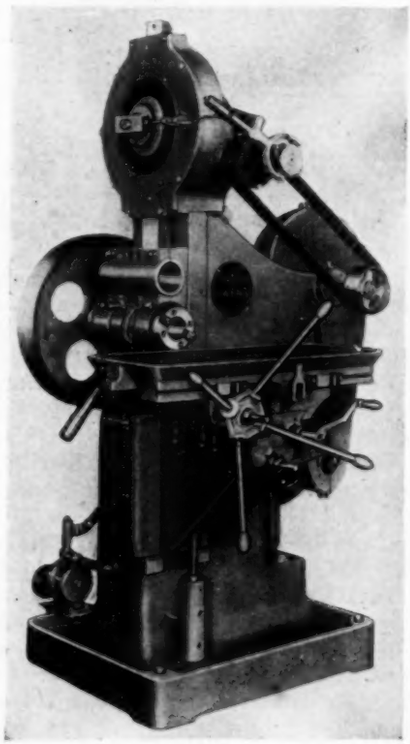
Fig. 1—Producto No. 11 D Double-Spindle Cam Milling Machine. Fig. 2—Right-end view showing the workhead adjustments

Kent-Owens High-Production Milling Machine

THE milling machine now offered by the Kent-Owens Machine Company, Toledo, Ohio, has a cam feed to the head in order to permit the use of a speed, or rate of travel, to suit any change in cross-section of the cut, with consequent maximum production. The feed is operated



Kent-Owens High-Production Milling Machine with flywheel-type spindle

continuously, or is disengaged automatically upon the completion of the cycle. In the former case the machine passes through its cycle continuously, the operator merely loading and unloading the machine. An index fixture can be used advantageously on many jobs. This fixture increases production still further, as the operator can load one side while the other is milling.

In the motor-driven machine, the motor is mounted on the back of the column. The drive to the backshaft is through a silent chain, and both the vertical feeding arrangement and spindle drive are taken by belts from this backshaft. The backshaft and spindle are mounted on Timken tapered roller bearings. The spindle is of the standard type.

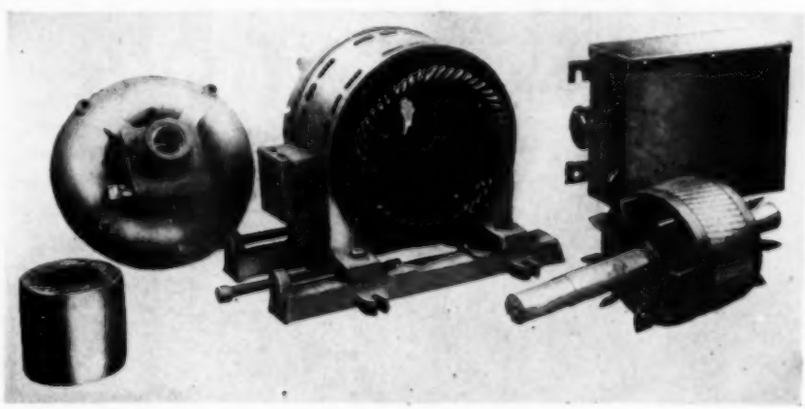
The cam drive is through a hardened steel worm and bronze wormwheel, between which the wear is taken up by means of an eccentric bushing. The cam and follower are of hardened steel.

The heavy flywheel-type spindle prevents chatter and vibration. All controls are conveniently located. Cams to suit any particular job can be furnished. Overall dimensions of the table are 35 in. long by 14 in. wide. The maximum distance from the table to the center line of the spindle is 17⅛ in. The machine may be driven either by motor or through a countershaft.

Howell "Red Band" Single-Phase Motor

Simplicity of design and construction is the outstanding characteristic of the "Red Band" brush-less, single-phase motor introduced recently by the Howell Electric Motors Company, Howell, Mich. According to the manufacturer, the construction features approximate those of a squirrel-cage type. The only auxiliary equipment used in the operation of the unit is the starting box shown behind the unit. This contains starting condensers and a simple automatic contactor that disconnects the condensers from the circuit as the motor comes up to full speed. Because of this feature the motor has no brushes, commutators, internal switching devices, nor wire-wound rotor.

The motor can be reversed at full speed without injury, making it suitable for single-phase operation on machine tools, elevators, hoists, automatic doors and windows, and for application as a general-purpose machine. It is claimed that the power factor and efficiency equal that of a polyphase motor of corresponding rating and its pull out and starting torques also compare favorably.



Howell "Red Band" Single-Phase Motor

"Hascrome" Welding Rod

A self-hardening, chromium-manganese-iron alloy, known as "Hascrome," is now made by the Haynes Stellite Company, Kokomo, Ind. The material is available in ¼-in. rods, 36 in. long, in bundles of 50 lb. and in lots of 1,000 lb. It is intended for the hard facing of wearing parts. It is used chiefly for building up badly worn parts preparatory to surfacing with ⅛ to ¼ in. of "Stellite." It possesses strength and toughness. In addition it is a good base metal for Stellite, because it is hard enough to resist a mushrooming effect under impact, and because the Stellite flows onto it easily. The material is also used to some extent for attaching "Haystellite" to oil-well drilling tools.

Hascrome is applied by the oxy-acetylene process on steel and on cast iron. The hardness of the deposit depends upon the amount of acetylene used in the flame, and the rate of cooling. Brinell hardnesses are as follows: With small excess of acetylene, slowly cooled, 250-300,

quenched, 240-290; with heavy excess of acetylene, slowly cooled, 450-500, quenched, 350-450. With the metallic-arc process, a current of 200 to 250 amp. is most suitable and the deposit is very adherent. It has a Brinell hardness, slowly cooled, 240-500; quenched, 240. The deposit has a tensile strength of 40,000 lb. per sq. in. and can be forged but not machined.

Oxweld Types CLP-2 and CLP-3 Acetylene Generator Trucks

The Oxweld Acetylene Company, 30 E. 42nd St., New York, N. Y., has recently introduced two trucks to accommodate the Type CLP-3 and the Type CLP-2 "Carbic" low-pressure acetylene generators, respectively. The smaller truck, Fig. 1, will hold one cylinder of oxygen in addition to the Type CLP-2 Carbic generator. It runs on two 24-in. steel wheels and one 5-in. caster operating on a roller bearing. All wheels have grease cups.

The truck, Fig. 2, designed to carry a CLP-3 Carbic generator carries two cylinders of oxygen, is sturdily constructed throughout, and is oxy-acetylene welded. It has two 24-in. steel wheels, with 3-in. tires, to carry the back part of the truck. A third wheel, in the front, is of caster type, 12 in. in diam. by 2 in. wide. This arrangement allows the truck to be turned in a radius about equal to its own length. All wheels are provided with grease cups of standard design.

The generator is secured to the steel deck of the truck by means of angle-iron braces and two long bolts which are inserted in the handles of the generator and tightened by means of turnbuckles. The oxygen cylinders are chained to a steel rack which is fastened to the deck of the truck beside the generator. A sturdy crane is provided to be used in charging and emptying the generator. With this crane it is an easy matter to lift the gas-bell out of the generator. The water and residue can then be drained off through the outlet at the bottom. The crane jib is made in three sections that can be telescoped when not in use to decrease the height.

The truck is provided with a steel tool box with loop fastenings. This box can be used for wrenches, small tools, or for a welding or cutting outfit of the usual size.

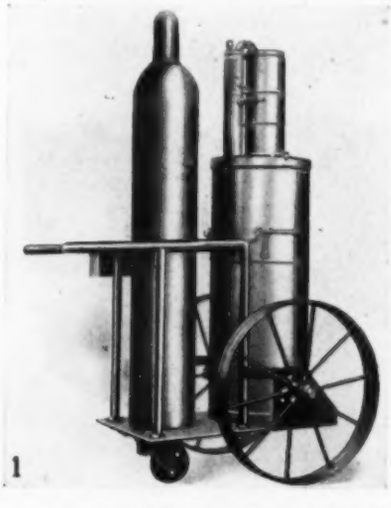
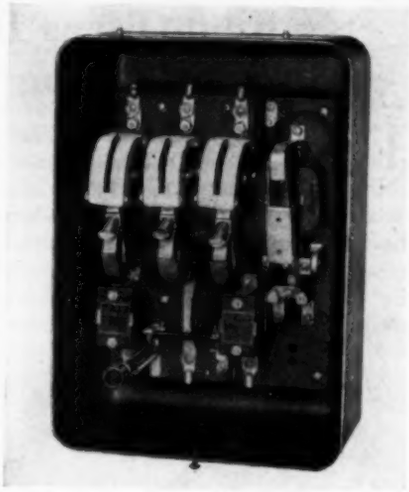


Fig. 1—Oxweld Type CLP-2 Acetylene Generator Truck. Fig. 2—Type CLP-3 Acetylene Generator Truck carries two cylinders of oxygen

General Electric No. CR-7006-D-30 Magnetic Switch

A magnet switch designed primarily for throwing small motors directly across the line, and known as the CR-6005-D-30, has been announced by the General Electric Company, Schenectady, N. Y., to supersede the CR-7006-D-4 type. This switch can be used as a primary switch for slip-ring motors having secondary control. It is suitable for use with small motors wherever a simple, direct control, with complete protection to motor and operator, is required.



General Electric No. CR-17006-D-30 Magnetic Starting Switch

A drawn-shell-type case, in which there is ample room for wiring, incloses the switch. The reset button for the overload relays extends through a hole in the cover, allowing it to be used without removing the cover. Practically all parts of the switch have been improved, and incorporate features of the latest design. The changes include the use of a molded shaft that will not stick in the bearings, thermal overload relays with interchangeable heater units, silver contacts on the holding interlock, an E-frame magnet that requires a minimum of power to operate it, and restricted-type blow-outs.

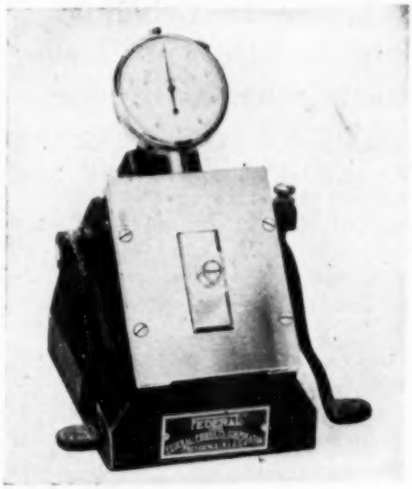
The horsepower ratings at various voltages for the switch when used with the standard squirrel-cage type of motor are: 110 volts, 7½ hp.; 220 volts, 15 hp.; 440 to 600 volts, 15 hp. For straight starting duty, where no jogging occurs, the 15 hp. rating on the 440- to 600-volt switch can be increased to 20 horsepower.

Federal Model 36 Small Hole Gage

The small hole gage, Model 36, offered by the Federal Products Corportation, Providence, R. I., is intened for measuring roundness and size variations of small holes from ⅜ up to 1½ in. The gage can be operated from either side, and the parts can be gaged as rapidly as the

operator can place them on the jaws of the instrument.

The indicator is graduated in 0.0001 in. around the 2¾-in. dial, and the graduations representing 0.001 in. are ¾ in. apart. Jaws are furnished in four sizes, ⅛ to ½ in., ½ to ¾ in., ¾ to 1⅛ in., and 1⅛ to 1½ in.



Federal Model 36 Small Hole Gage

One size is supplied with each gage, others being supplied at extra charge.

The gage is easily set to measure different sizes of holes by removing the top plate and loosening the clamping screws that clamp the lower jaw in the dovetail. A master-plate is put on the jaws, or micrometers are used, as prefered, so that the indicator registers about 0.001 in. on the minus side of zero. By tightening the jaws the gage is made ready for use. The small screw on the upper right-hand lever is a stop to adjust the range of the indicator.

Advantages claimed for the gage are longer wear, high accuracy, convenient operation, and greatly increased output.

"Square D" Combination Starter

The combination starter for automatic electric-motor control, placed on the market by the Square D Company, Detroit, Mich., and produced at the Industrial Controller Division located at Milwaukee, Wis., is manufactured in three capacities in amperes, and in six types, making use of across-the-line starters up to 30 hp., 220 volts, and 50 hp., 440 and 550 volts, either two- or three-phase.

Each combination starter is a complete unit, consisting of an across-the-line starter combined with a motor-circuit switch, mounted together in one cabinet. The motor-circuit switch not only acts as a disconnecting switch, but also is capable of opening the circuit while the motor is under load.

The combination starters are arranged for the insertion of a test-jack in the motor-circuit switch while the motor is running, to facilitate the obtaining of accurate load data on the motors while they are operating under working conditions. The units may be obtained with fuse blocks between the motor circuit switch and the starter, if desired. The illustration shows a Class 8532-S, type A, 20-amp. combination starter. A substantial saving in wiring cost is claimed for these devices, because of the ample wiring space provided.

"Square D" Combination Starter rated at 20 amperes

Enterprise Station-Type Drilling Machine

AN EIGHT-SPINDLE, all-purpose, continuous rotary machine, which is suitable for drilling, tapping, spot-facing, counter-boring and other operations on production manufacture of precision-type automotive, radio, and electrical parts, has been placed on the market by the Enterprise Manufacturing Company of Pa., Third & Dauphin Sts., Philadelphia, Pa. A battery of these machines may be synchronized for successive operations on the same piece. The machine shown in Fig. 1, is motor-driven and is supplied with an all-geared head. Simplicity of construction is a feature.

The carrier containing the spindles and work tables rotates continuously around the column. There is a table for each spindle. During each revolution of the carrier, each table drops clear of the drill, and is again raised and fed to the drill. The spindles have no vertical motion. The operator is stationed at the side of the machine where the tables drop. As each table drops the operator removes the finished piece and replaces it with a fresh one. In most cases the automatic jig, which is a standard extra for the machine, clamps the work so that the operator's task is merely to move the piece.

When successive operations are performed on the same piece, the tools for these operations are mounted in sequence in the spindles and the operator advances the piece one spindle each time it comes around to him until the piece is finished, always putting a fresh piece on at the spindle where the first operation is

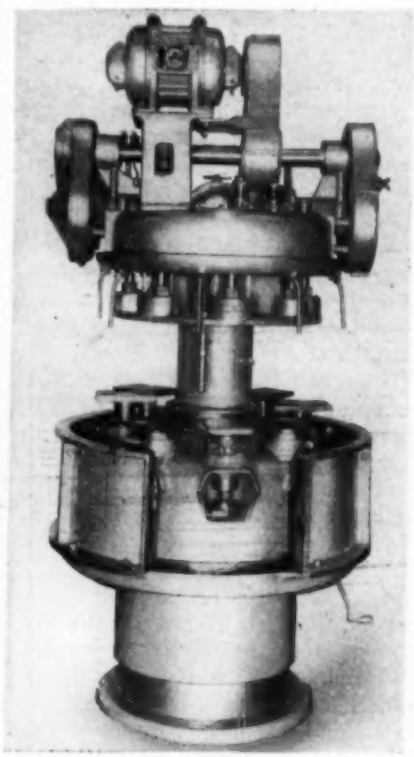


Fig. 1—Enterprise Station-Type Drilling Machine

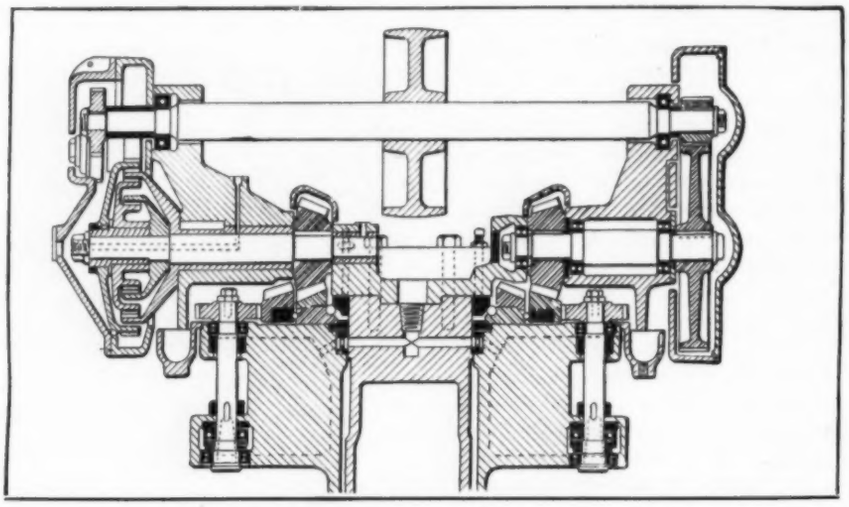


Fig. 2—Cross section of the head of the Enterprise Station-Type Drilling Machine showing the spindle and carrier drives

performed. Cams can be mounted on the cam rail for indexing jigs and operating knockouts.

As shown in Fig. 2, the gears of the spindle drive mesh with a combined spur and bevel gear driven through a bevel pinion and a pair of spur gears by the right end of the pulley shaft. The spindle speed is changed by changing the pair of spur gears. The carrier is driven from the left end of the pulley shaft through the change gears, planetary gearing, a second bevel pinion and bevel gear. The speed of the carrier is changed by means of the change gears. The smallest member of the planetary gearing is 5 in. in diam. The carrier drive is protected by a suitable shear key.

A roller at the bottom of each table plunger rides on a fixed ring cam. The cam shape determines the feed motion. Individual adjustment of the tables is made by the right and left stem. This stem extends entirely through both parts of the table plunger. Each table is provided with a shear pin. Simultaneous adjustment of all tables is made by rotating the large nut on the column by means of the crank and worm geared to it. Lubrication is provided for in all places. All gears and working parts are carefully and substantially inclosed, but are easily accessible.

Capacity: Maximum depth of holes drilled with standard cam, 1¼ in.; maximum diameter of hole drilled in cast iron, ¾ in.; maximum diameter of hole drilled in 0.40 carbon steel, ⅝ in.; maximum facing diameter $\frac{1}{16}$ in. deep in cast iron, 1½ in.; maximum facing diameter $\frac{1}{16}$ in. deep in steel, 1¼ in.; working torque permissible on spindle, 300-in. lb., power required 5 to 15 hp., according to the character of the work.

Dimensions: Spindles, 1⅜ in. diam., No. 3 Morse taper; distance from spindle to top of table, when table is at highest point of cam, maximum, 16¾ in., minimum, 10 in.; distance from center of spindle to column, 6½ in.; distance from center to center of spindles in circle, 9-in.; height of table from floor at loading point, maximum, 42 in.; standard cam, total movement, 2 in.; special cam, total movement, 3 in.; floor space, 4 ft. x 4 ft.; weight, 5,000 lb. approximately.

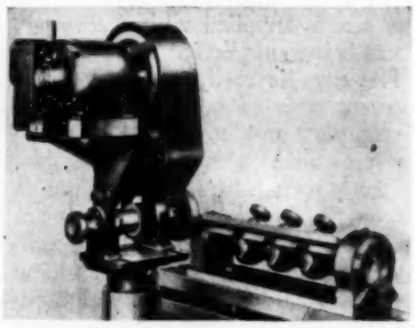
Lincoln "New Kathode" Welding Electrode

For arc welding of mild steel and for repair work on cast iron, a welding electrode known as the "New Kathode" has been placed on the market by the Lincoln Electric Company, Coit Rd. & Kirby Avenue, Cleveland, Ohio. The rod will flow easily, with freedom from sputtering, and produces a clean weld with minimum slag and oxidation. It is permissible to use high heat with this electrode, which is fast running, thus making possible increased welding speed. It is claimed that the quality of the weld is not sacrificed for speed of welding, as the electrode fuses easily with deep penetration. The resulting weld on steel is soft and readily machineable.

The New Kathode electrode is manufactured in stock lengths of 14 and 24 in. It is packed in a metal container holding 50 pounds.

Fixture for Grinding Support Blades of Cincinnati Centerless Grinders

An attachment to be used with the No. 1½ plain cutter and tool grinder used for regrinding the wearing surfaces of all standard support blades for the Nos. 2, 3, and 4 centerless grinders made by Cincinnati Grinders, Inc., has been placed on the market by the Cincinnati Milling Machine Company, Cincinati, Ohio. It is said that the blades should be reground to eliminate the hollows, which result from wear, and which produce chatter, out of roundness, and inaccurate work. These difficulties may often be corrected by changing the blade angle, and this can be done easily with this equipment. The blades that are reground will not be affected by warping, because they are held in the fixture in the same manner as on the grinder.



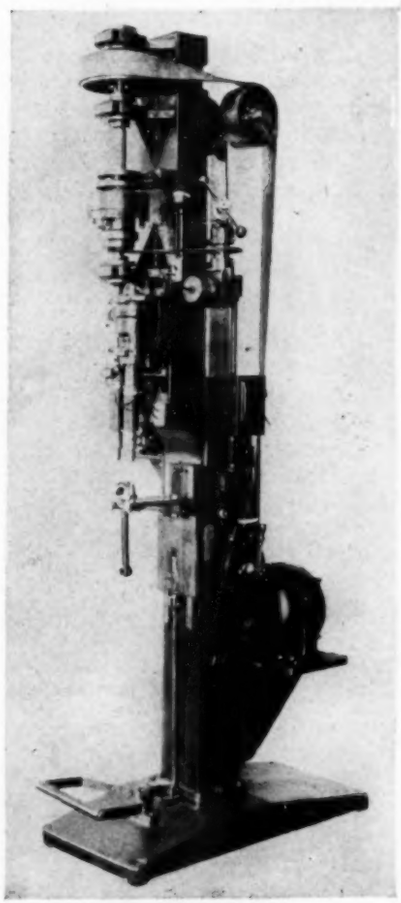
Fixture for regrinding the wearing surfaces of grinder support blades used on the Cincinnati Nos. 2, 3, and 4 centerless grinding machines

The time required to make the set-up is only 2 min., and the support blades are finished all over, except the wearing surface prior to the grinding operation. The fixture is made of aluminum and is rigidly constructed. It will take support blades with a maximum length of 16⅝ in., ¾ in. wide and 4 in. high to be ground at any angle from a flat top to 45 degrees.

Baush Two-Spindle Nut-Driving Machine

THE Reynolds nut-driving machine, formerly manufactured by the Metalwood Manufacturing Company, and described on page 872, Vol. 67, of the *American Machinist*, has been taken over by the Baush Machine Tool Company, Springfield, Mass. Certain improvements have been made and these will be brought out in the following.

In the rear of the column is a vertically-adjustable bracket carrying a 2-hp. constant-speed motor.



Baush Nut-Driving Machine

Countershaft drive is optional equipment. Where d.c. is not available, a d.c. generator may be fitted. The belt from the motor passes over idler pulleys to a driving pulley at the top of the machine. The lower end of the drive shaft supports a magnetic clutch. One spindle is driven directly from a differential and the other through a quill gear and idler gear. The second spindle is mounted in a slide, which is adjustable across the column to permit of the spindle being set at any desired center within a range that varies from $2\frac{1}{8}$ to 6 inches.

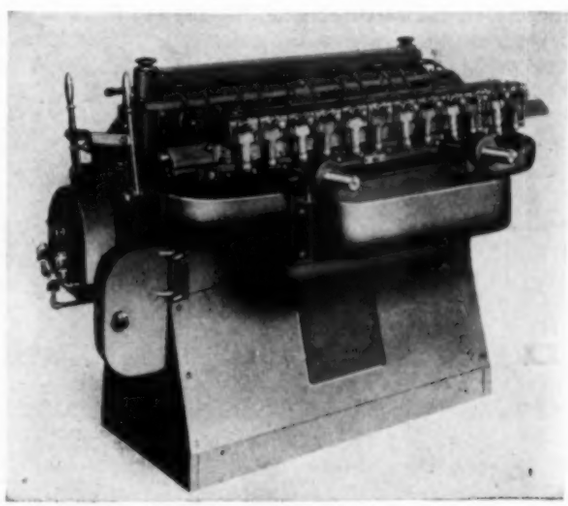
The lower end of the spindle carries a detachable socket wrench in which the nut or capscrew is placed and held magnetically. The machine has been improved by substituting a centrifugal mechanism for making and breaking the magnetic clutch circuit through a mercury switch in place of the epicyclic mechanism previously employed. The electric circuit has also been improved.

In operation the nuts or capscrews are placed in the socket wrenches, which are at rest, and the parts to be assembled are placed in the fixture in line with the spindles. The pedal is depressed as the work bracket moves upward. The magnetic clutch is energized and starts the spindles in motion. As the pedal is further depressed, the nuts or screws are driven to a tightness determined by the adjustment of the rheostat. When the magnetic clutch starts to slip, the clutch circuit is opened, thus releasing all torque on the spindles and allowing the work to be withdrawn freely from the wrenches by releasing the pedal. The operation is then repeated. The spindles run at approximately 500 r.p.m., so that the operation is quite rapid.

Kent Multiple-Spindle Horizontal Drilling Machine

THE Kent Machine Company, Cuyahoga Falls, Ohio, has recently brought out a multiple-spindle driller, that not only can be adapted for drilling several pieces during one cycle of the machine, but also, by use of a cluster drillhead attached to the machine, is adaptable to drilling several holes in each piece. While the machine is similar in design and operation to the standard No. 1 six-spindle horizontal driller that has been manufactured for some time, it is much larger and heavier in construction and contains many additional features in addition to the cluster drilling mechanism. The driller is manufactured with six single spindles on $7\frac{1}{2}$-in. centers, or a series of six units of specially designed cluster drillheads on the same center distances. The rate of production of the machine is governed by the r.p.m. of the camshaft, which is controlled through a series of change gears and adjustable dogs. By means of this combination it is possible to adjust the speed of machining to the rate at which the operator can feed the parts to be drilled to the fixtures. The feed of the drill per revolution is controlled by a feed cam that may be varied in speed by the change gears controlling the camshaft. The change gears are to the left.

Twelve fixtures are required for the machine, two being used in connection with each drillhead. These fixtures may be designed to accommodate any work within the capacity of the machine. They occupy positions alternately in front of and between the drill heads. When in line with the drillheads the fixtures are auto-



Kent Multiple-Spindle Horizontal Drilling Machine

matically locked, thereby securely holding the work for the drilling operation. In the alternate position they are opened, allowing the operator to remove the drilled parts and load the fixtures for the next operation. Thus, while the drill table moves forward for the drilling operation, six fixtures hold the parts being drilled, while six other fixtures are being filled by the operator.

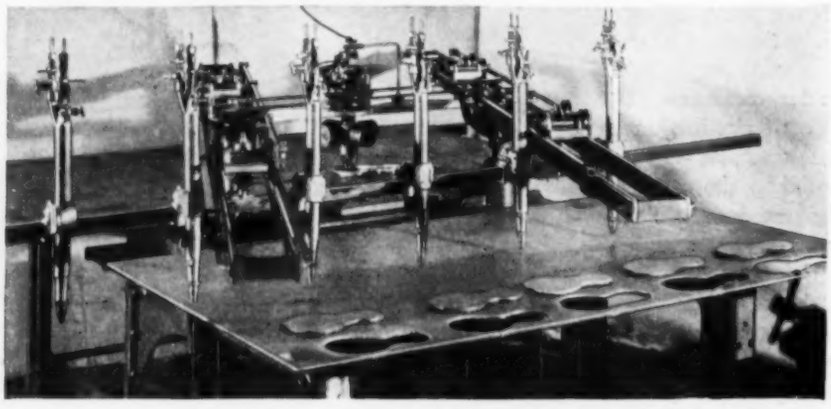
Either motor- or belt-drive is furnished. When motor drive is employed the motor is located on a movable carrying angle plate in the base of the machine, and is quickly and easily adjusted for change of speed, or for tightening the silent chain.

"General" Six-Torch Automatic Shape-Cutting Machine

The General Welding and Equipment Company, 66 Brookline Ave., Boston, Mass., offer a six-torch shape-cutting machine for the automatic cutting of parts for industrial products from steel plate or preforged steel billets. The work is supported on a framework attached to the table of the machine. On the table is mounted the templet, or model, of the part to be produced.

A tracing point, carried on an arm of the machine, is used by the operator to follow the outline of the templet. Through a pantograph mechanism the motion is transferred to the arm carrying the six oxy-acetylene torches that do the cutting. These torches are constrained by the mechanism to trace out on the steel plate paths of exactly the same shape and size as the original templet, and the flame cuts out the parts along the line of travel, six at a time. Shapes are cut to sizes within $\frac{1}{32}$ in. of exactness, which is close enough for most purposes, and avoids the necessity for refinishing except for close work. Complicated parts can be welded from shapes.

This process can be applied to the producing of parts formerly made by forging or casting. The economies claimed as a substitute for forging are: Reduced labor force and equipment, absence of costly dies, conservative of floor space, and reduced production cost. Also serviceable parts can be produced from old or scrap material. The advantages claimed over castings are: Absence of costly patterns and flasks, avoidance of defects such as blow-holes, and simplification of control of raw material, which is steel plate suitable for any use, instead of special purpose rough castings.



"General" Six-Torch Automatic Shape-Cutting Machine

"Buffalo" 16-Inch Sensitive Drilling Machines

THE drilling machines offered by the Buffalo Forge Company, Buffalo, N. Y., will drill $\frac{5}{8}$- to $\frac{7}{8}$-in. holes in cast iron, and have been designed for high production operations. The head brackets are made of cast iron, and the column of steel. The outer part of the spindle is guided by a sleeve running in bronze bearings bearing.

The drilling machines are made in a bench type, having a hand-lever feed, and a floor type having a hand lever and treadle. A knurled nut directly back of the feed pinion enables the treadle to be idled. The floor-type machine can be furnished without the treadle attachment, if desired. Ball bearings of SKF type are used throughout. The belt slack can be taken up by loosening the hand-operated nut on the shifter bracket, which permits the adjustment of the belt with a handwheel at the left side of the machine.

Specifications, on both the floor- and bench-type machines are: Capacity, with $\frac{1}{3}$-hp. motor at 1,725 r.p.m.—holes in steel, $\frac{7}{16}$ in., holes in cast iron, $\frac{5}{8}$ in.; with $\frac{1}{2}$-hp. motor—holes in steel, $\frac{9}{16}$ in., in cast iron, $\frac{7}{8}$ in.; drills to center of 16-in. circle; spindle speeds, 418, 835 and 1,725

"Buffalo" Floor-Type 16-Inch Sensitive Drilling Machine

r.p.m.; travel of spindle, 7 in.; spindle bored No. 2 Morse taper; steel column, 4 in. in diameter.

Specifications of the floor-type are: Height, 76 in.; greatest distance, base to spindle, 46 in.; greatest distance, table to spindle, 38 in.; ad-

justment of head, 8½ in.; tilting table, 12 in. sq.; base, 21 in. in diam.; net weight, 400 pounds.

Specifications of the bench-type are: Height, 48 in.; greatest distance, table to spindle, 28 in.; table stationary; base of table, 15¼x22½ in.; table working-surface, 12¾x12¾ in.; net weight, 350 pounds.

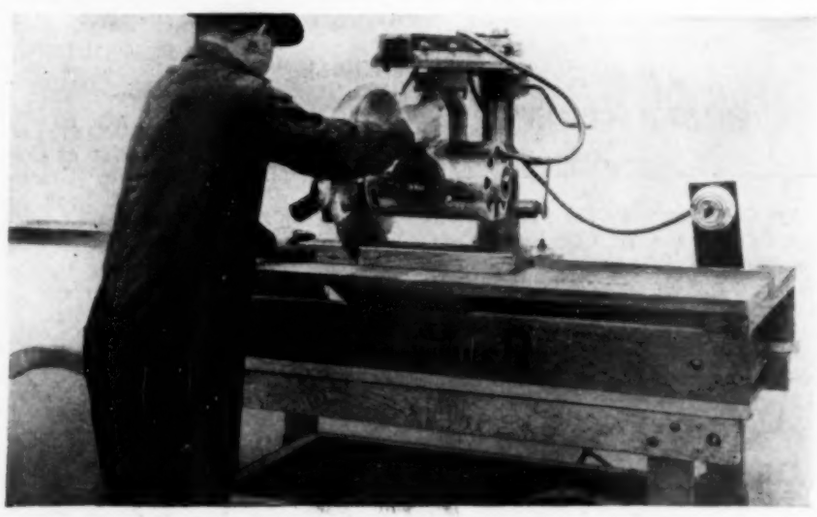
DeWalt Improved Model D "Wonder Worker" Saw

Improvements in the Model D woodworking saw, manufactured by the DeWalt Products Corporation, Leola, Pa., make possible the delivery of fully 50 per cent more power to the work, it is claimed. The machine performs 29 operations.

The machine is credited with ripping 4-in. fir at the rate of 50 lineal ft. per min. It cross-cuts 6-in. material, and can be switched from cross-cutting to ripping without stopping the motor.

Another improvement introduced is the placing of the dialplate, with degree markings and pitch scale, in front of the operator for easy adjustment for angle-or bevel-cutting. The dial-plate is notched at each 45 deg. for rapid finding of angles. The motor is secured in any cutting position by means of a positive lock.

The machine is driven by a two- or three-phase, 5-hp. motor. The improved motor design gives greater power on full load, and less temperature rise. The Model D saw is portable, weighs 340 lb. and is fitted on a sturdy 29x59-in. portable table.

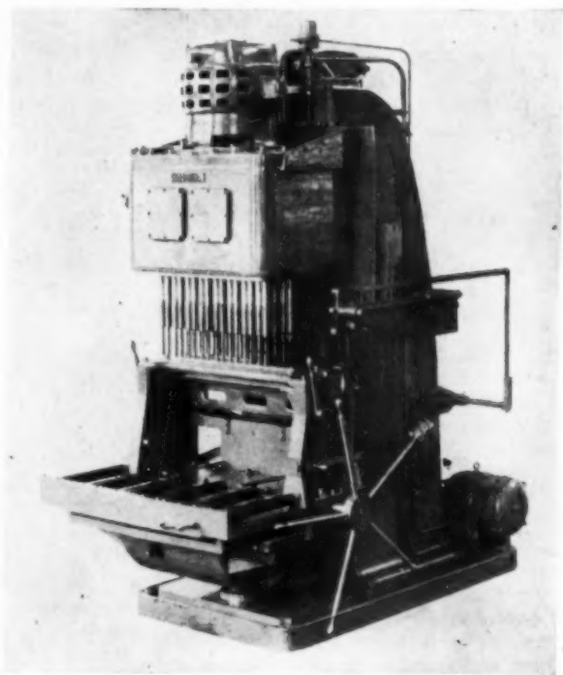


DeWalt Improved Model D "Wonder Worker" Saw

Defiance Valve-Hole Drilling, Reaming, Counterboring and Spot-Facing Machine

THE fixed-center head of this heavy, direct-motor-connected, Oilgear-feed machine can be made with any number of spindles to suit requirements in the drilling, reaming, counterboring and spot-facing of valve holes in automobile and tractor cylinder blocks. It has been developed by the Defiance Machine Works, Defiance, Ohio. All spindles are made of heat-treated alloy steel, and are equipped with heat-treated helical gears equipped with ball thrust bearings. The head is inclosed and is supplied with forced-feed lubrication. Oilgear feeds permit an infinite adjustment of the feeding rate and provide rapid traverse movement to and from the work. The machine is equipped with an adjustable table with screw jack supports for the overhang. The table extends in front of the machine, and is fitted with rollers to connect with conveyor tables for passing the blocks from one machine to another.

The column is a heavy cored casting and supports the Oilgear cylinders and also incloses the weights that counterbalance the head. The fixtures for the various operations are built to suit requirements. For some operations they are rigid, while for others, sliding types with bushing plates and hardened jig eyes may be supplied. The approximate weight is 18,500 lb., and the floor space occupied is 108 x 64 in. The motor recommended for driving the head varies in size from 15 to 20 hp., with a speed of 1,200 r.p.m. A 2-hp. motor is required for driving the Oilgear feed unit at a speed of 900 rev. per minute.



Defiance Valve-Hole Drilling, Reaming, Counterboring, and Spot-Facing Machine

"Workace" Electric Shaper for Pattern Shops

Intended for use in small cabinet shops, pattern shops, carpenter and maintenance shops, the "Workace" electric shaper has been announced by J. D. Wallace & Company, 134 S. California Ave., Chicago, Ill. This

"Workage" Electric Shaper for pattern Shops

tool is direct motor driven and the armature shaft and shaper spindle are integral. It has a no load speed of 10,000 r.p.m. and the means of lubrication are designed so that no excess oil can reach the motor and injure the windings.

The table is mounted on a screw and is locked securely in any position by a handwheel. The steel spindle is $\frac{5}{8}$ in. in diam., extends $3\frac{5}{8}$ in., and has a capacity of $2\frac{1}{2}$ in. between the two steel shaper collars, or $3\frac{1}{4}$ in. using solid cutters.

The shaper operates from a universal motor and can be used on the ordinary lighting circuit. It weighs 42 lb., and sits firmly on its own base without fastening. A combination guard and fence may be supplied as extra equipment. The light weight of the unit makes it possible to use the machine as a bench tool or to carry it to the job, as may be desired.

REVIEW · OF · RECENT · PATENTS

Relating to the Machinery and Metal Products Industries

Metal-Working Machinery

Patent 1,718,239, assigned to the Bethlehem Steel Co., relates to a bolt-pointing machine in which a pointing member, blank holder, die, and various other parts are combined in novel fashion.

A bolt-heading machine, patent 1,718,265 granted to William Lukens Ward, Port Chester, N. Y., combines an open die-type header, reciprocal punch and ram, as well as means for operating these and other parts in timed relation.

Roy L. Carter, of Phoenix, N. Y., has been granted patent 1,718,275 covering a combined router and work support. The machine comprises a pedestal, work table, swinging guide, pedal-operated reciprocable member and other parts.

A machine for electric riveting, patent 1,718,715 assigned to the Spencer Thermostat Co., comprises a work-table with pivoted arm and pressure-applying element, and an electric circuit, of which the work support and pressure-applying element are terminals.

An electric heating and forging machine, patent 1,718,364, has been assigned to the Electromatik Forging Machine Corporation. It covers an electric heating device, a die member, and electric conductive bridges to restrict heating to selected parts of the work.

To the Kearney & Trecker Corporation is assigned patent 1,718,562 relating to a milling machine structure, which comprises inclosed gearing on different levels, an oil sump, and a lubricant pump.

Patent 1,718,554, assigned to the Boston Scale & Machine Co., relates to a grinder having hydraulic means for reciprocating a tool across work, means for rotating and feeding the work, and means for automatic reversal of the tool.

The Delco-Remy Corporation is assignee of patent 1,716,365 covering a machine for tightening screws and comprising a power-driven shaft, a screwdriver movable therewith, a holder for retaining parts including a screw, a manually-operated yoke and an overload slipping cone clutch.

TRADE PUBLICATIONS

Air Compressors. The Pennsylvania Pump & Compressor Co., Easton, Pa., has published Bulletin No. 147 showing a single-stage air compressor, giving, in particular a cross-sectional view. All assemblies and parts are completely described and illustrated. Specifications are listed. The bulletin contains 23, 11 x 8½-pages.

Cutting Oils. D. A. Stuart & Co., Inc., 2727 South Troy St., Chicago, has recently published a handbook on its product containing 64, 4x8-in. pages. It is more than a catalog since it contains a large amount of general information about cutting and heat-treating oils, their manufacture and use. For example, several pages are devoted to the discussion of the relation of tool angles to cutting oil efficiency. Other subjects are: Recommended tool angles; lubrication of broaches; sulphur-base cutting oils (general); analysis of soluble oils; grinding data; discussion on quenching oils; suggestions for pipe threading; and a glossary of oil terms. The particular brands of Stuart oils are also described in detail. The booklet is illustrated, largely with blueprints of typical parts with cutting data.

Flexible Shaft Equipment. The Stow Manufacturing Co., Inc., Binghamton, N. Y., has published bulletins showing the Stow flexible shafts, shafts fitted with tools, and various joints and clutches.

Grinders, Swing-Frame. The Norton Co., Worcester, Mass., has published two bulletins showing the 16- and 24-swing-frame grinders for high-speed snagging. Specifications, pictures, and descriptions are given.

Steel Shop Equipment. The Standard Pressed Steel Co., Jenkintown, Pa., has published a folder showing various steel benches, tables, desks, and other equipment for shops and offices. Short descriptions of each item are included.

Steel Tables. The Universal Fixture Corporation, 135 W. 23d St., New York City, has published a bulletin showing the No. 900 series of steel tables, and a wall pivot displayor for drawings.

Threading Machines. The Landis Machine Co., Waynesboro, Pa., has published a 20-page booklet entitled "Threading Specialized," giving a description of Landis dieheads, pipe threading and cutting-off machines, staybolt threading machines, pipe and nipple threading machines, automatic forming and threading machines, and Victor collapsible taps. The machines are shown in operation and the principal features are listed.

Buyers' Guide, New Orleans, 1929. The New Orleans Association of Commerce, P. O. Box 1460, New Orleans, La., has published a "Red Book and Buyers' Guide" of New Orleans commerce for 1929. Much historical and geographical data are presented, together with a listing of the membership of the chamber and a classified buyers' index. The book contains 152, 12x9½-in. pages.

Safety Campaigns. The National Saftey Council, 108 E. Ohio St., Chicago, Ill., has published pamphlet No. 51, "Planning an Industrial Safety Campaign," which summarizes campaign methods in use by a number of industrial organizations.

NEWS
OF THE WEEK

Latin America Looking for "Last Word" in New Industrial Equipment

Increased Demand for Latin-American Products Creates Large Machinery Market

By Paul Wooton
Washington Correspondent, American Machinist

IN DESCRIBING the status of South America's development, comparison is made frequently to the United States of 60 or 70 years ago. Sight is lost frequently of the fact that there is available now the experience gained during the pioneer stage of this country's development, and that there is now more capital available for the opening of new country. As the consuming capacity of the world has increased, there is now a relatively greater demand for most of the products of South America.

For these reasons, development in South America is proceeding at a prodigious rate. Since it is scattered over a great continent, there is no general appreciation in this country of the progress being made to the south of us. Under the present immigration policy of the United States, the main stream of European immigration has been diverted to South America. Thousands are being added every month to those gainfully employed.

This increased activity, combined with the zeal of public officials to provide highways, railroads, other utilities, harbors, and public buildings, is building up a great demand for machinery. For the next decade it is anticipated that construction equipment will continue to lead the list of the machinery imports of South American countries.

One of the characteristics of the South American trade is the demand for high-grade equipment. Many operations there represent the "last word" in advanced practice. For instance, steam shovel performance at the Cerro de Pasco mines is said to be second to no other in the world.

The airplane promises to be an effective agent in speeding up development in South America. With vast areas untapped by railroads and with great physical obstacles in the form of jungles, mountains, and streams the airplane offers ready transportation. Skilled managers and technical men under these conditions can be secured readily for isolated enterprises. Were it not for the airplane, it would be hard to induce skilled personnel to undertake work at interior points difficult of access. The airplane, for instance, is making it possible to study the geology of the eastern slope of the Andes at a much more rapid rate than would have been the case were it necessary for geologists to undergo the hardships of land travel.

The prospecting of new mineralized areas in South America at the present rate is certain to be reflected promptly in orders for operating equipment.

The fear is expressed frequently that the present rate of development might at any time be interrupted in nearly any one of the South American countries by some political disturbance. While no one fails to appreciate the advantages of conducting business enterprises under stable social conditions, it has been demonstrated in Mexico, in China, and in Russia that profitable enterprises are entirely possible under conditions much worse than any likely to occur in South American countries. Capital today is much less timid than it was 20 years ago. As the prospects of earning unusual returns are great, the present trend is expected to continue. Present promise, at least, is that the greatest potential foreign market for American machinery lies south of the Rio Grande.

* * *

Canadian Automobile Industry Made New High Record in 1928

Production in the automobile industry in Canada in 1928 reached a new high value of $162,867,495, as compared with $128,700,514 in 1927, and $133,598,456 in 1926, according to figures just released. These totals include the value of cars, parts, and accessories produced during the year and also the amounts received for custom work and repairs made at the factory. Automobile production alone also attained a new high record in 1928 of 242,054 cars having a sales value, f.o.b. plant, of $149,176,999. This output was 18 per cent greater in number and 22 per cent greater in value than in 1926, the next best year, when the 204,727 cars manufactured were valued at $122,629,537.

While production has increased to the extent indicated, imports show a still more rapid increase. In 1917, the value of automobiles and parts imported was $19,426,492, while in 1928 the value had increased to $89,672,831. In 1917, imports were about 35 per cent of home production, but in 1928 they were 55 per cent. Practically all imports were from the United States. The capital invested in the industry in 1921 was $40,080,269. This had grown to $97,056,000 at the end of 1928. Wages paid in 1921 totalled $7,881,173, as compared with $29,548,114 last year.

* * *

Census Shows Materials Cost More Than Labor

Figures in the 1927 Analysis of Manufactures, just released by the U. S. Census Bureau, show that during that year $33,235,799,366, or 53 per cent of the total value of all products manufactured in the United States was spent for materials and supplies, as compared with $27,585,210,400, or 44 per cent, for the value added by manufacture, largely labor. Fuels and power cost only 3 per cent of the total of $62,718,347,289, the value of all manufactured products. This

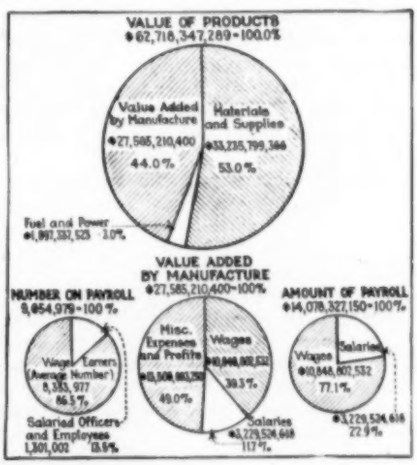


figure is considerably larger than the aggregate value of manufactured products in the form in which they reach the ultimate consumer, because the amount is obtained by totalling the aggregate figures reported by the individual establishments, even though the ultimate product of some manufactories is the raw material of other industries.

The accompanying chart also shows the relation between the number of salaried employees and the number of wage earners, the comparative amounts of the respective payrolls, and an analysis of the value added by manufacture.

In the chart, the term "Materials and Supplies" refers to all materials and supplies used during the year; "Fuel and Power" includes the cost of fuel oil, coal, and purchased electric current; "Value of Product" represents the selling value at the factory of all products manufactured during the year, whether sold or not; and "Value Added by Manufacture" is calculated by deducting the cost of material and supplies, fuel, and power from the value of products.

* * * *

Mechanical Engineering Teachers Hold Summer Session at Purdue

By F. L. Eidmann

EIGHTY-EIGHT teachers of mechanical engineering attended the sessions of the Summer School for Engineering Teachers which was held from June 27 to July 18 at Purdue University and the Hawthorne Works of the Western Electric Company. The school was conducted under the direction of the Board of Investigation and Co-ordination of the Society for the Promotion of Engineering Education and with the co-operation and support of the A.S.M.E., Purdue University, and the Western Electric Co. Prof. H. P. Hammond, associate director of the staff of investigation of the S.P.E.E., was director of the session, with Dean A. A. Potter of Purdue University acting as local director, and Prof. H. L. Solberg of Purdue University acting as secretary.

The Summer School for Engineering Teachers is an enterprise growing out of the general investigation of engineering education begun by the S.P.E.E. in 1924. Its general purpose is the improvement of the teaching of engineering. Sessions of the school are held each year in different institutions throughout the country. Each session is devoted to the study of methods of teaching a particular subject of instruction or division of the engineering curriculum. The 1929 session was devoted to the study of teaching mechanical engineering.

The 88 members of the session represented 60 engineering colleges and came from 36 states and Canada, New York State leading with 15 members. The membership was divided into three divisions of equal enrollment: heat power, machine design, and production. The papers dealing with subjects of general interest were presented before the entire membership while those of a more specialized nature were presented before the groups.

Some of the papers presented before the entire group were: "Purposes and Scope of Mechanical Laboratory Courses," "Administration of Mechanical Engineering Laboratories," "Organization and Administration of Mechanical Engineering Departments," "Organization of Courses in Mechanical Engineering Subjects for Non-Mechanical Engineering Students," "Research in Mechanical Engineering," "The Teaching of the Principles of Automotive Engine Design," "Mechanical Engineering Problems in Aviation," "Fundamental Principles of Materials Handling," "Purposes and Scope of Courses in Mechanics of Machinery and Machine Design," "Modern Methods of Stress Analysis," "Recent Developments in the Application of Mechanics to Machine Design," "Purposes and Scope of Courses in Production Engineering," Management's Responsibility for Labor Administration in Industry and Its Relation to Engineering Education," "Teaching Values and Costs to Engineering Students," "Financing of Manufacturing Enterprises," and "The Fundamentals of Management Applied to Industrial Enterprises."

Papers presented before the machine design division, one of the three groups, included: "Analysis of Motion," "Kinematic Principles in Machine Design," "Classroom Methods in Machine Design," "Machine Parts," "Teaching of Materials in Machine Design," "Balancing," "The Principles of the Design of Machine Tools," and "The Design of Machine Tool Details."

The entire membership went to Chicago by special train as guests of the Western Electric Company for three days. Besides making tours of inspection in the Hawthorne Works, the group was addressed on various phases of organization, production control and management by officials of the Western Electric Co., and of the American Telephone and Telegraph Company.

* * *

Most Financial Reports Show Profit Increases

Reports for the second quarter and the first half of 1929 show increases in profits for practically all major companies. Some of the reports are summarized in the following paragraphs.

General Motors earned $89,949,323 for the second quarter, compared with $91,799,398 for the second quarter of 1928 and $59,807,011 for the first quarter of 1929. After deducting dividends on preferred and debenture stocks, there is $87,507,257 available for distribution among stockholders, equivalent to $2.01 a share of common stock, compared with $2.06 a share for the first quarter of 1928. Earnings for the six months ending June 30 totaled $151,860,310, comparing with $161,267,974 for the corresponding period a year ago. After deducting dividends on preferred and debenture stocks, there is $147,156,474, equivalent to $3.38 a share on the common stock, compared to $3.60 a share for the first half of 1928.

General Electric earned $32,028,154 during the six months ending June 30, compared with $25,675,307 for the corresponding period of 1928. The profit available for dividends on common stock is equivalent to $4.26 a share, compared with $3.38 per share during the same period of 1928, amounting to $30,740,768 during the first half of 1929 as compared with $24,388,002 during the same period of 1928. Sales billed increased 23 per cent over those of the same period of 1928.

The Westinghouse Electric & Manufacturing Co. reported net profits of $13,131,881 for the six months period, or $4.92 per share of common stock, compared with net profits of $7,860,755 or $3.31 a share for the first half of last year. Sales billed during the first half amounted to $99,927,790 as compared with $88,854,725 during the first half of 1928.

The Chrysler Corporation reported a net profit of $4.06 a share on the 4,452,609 shares of common stock for the six-month period, compared with $3.98 a share earned on 2,704,356 shares for the same period of 1928.

The Pierce-Arrow Co., now under Studebaker management, reported profits of $1,288,643 for the second quarter of 1929, as compared with a loss of $282,547 for the same quarter of 1928. First quarter profits were $448,532. Sales for the second quarter showed an increase of 94 per cent over those of the same period of 1928. Earnings for the first half were $1,737,175, compared with a loss of $642,220 for the first six months of 1928. The regular quarterly dividend of 1½ per cent was declared on preferred stock.

The Reo Motor Car Co. reported a net profit of $1,148,844, equivalent to $0.57 a share on common stock for the second quarter of 1929, compared with $537,514 or $0.26 a share for the preceding quarter, and $3,104,633 or $1.55 a share for the second quarter of 1928. Net profit for the first half was reported as $1,686,358, equivalent to $0.84 a share, compared with $3,018,144, equivalent to $1.50 a share, for the first half of 1928.

The American Bosch Magneto Corporation reported a net profit of $373,361 for the first half of 1929, equivalent to $1.80 a share on the common stock of the company. This compared with a net profit of $103,454 for the corresponding period of 1928. Net profits for the second quarter were reported as $150,169, equivalent to $0.72 a share, com-

pared with a profit of $223,192, equivalent to $1.08 a share, for the previous quarter.

The Worthington Pump & Machinery Corporation reported net profits of $1,099,428 for the first half of the year, equivalent to $6.91 a share, or $4.57 a share on the common stock with dividends overdue on preferred stock taken out of the total net profits.

The National Acme Co., Cleveland, reported profits of $811,588 for the second quarter, compared with $708,831 for the preceding quarter, and $193,136 for the second quarter of 1928. The profits for the first half were $1,520,419, compared with $391,103 during the first half of 1928.

* * * *

French Industries Undergo Difficulties As "Fictitious Prosperity" Continues

Wage Scale and Living Costs Rise Disproportionately

BY OUR PARIS CORRESPONDENT

PROSPECTIVELY, both industrial and trade conditions are due, short of a miracle, for a period of stagnation as a result of economic factors which have been making themselves felt for some months. From October, 1927, to April, 1929, living costs rose 23 per cent while industrial wages in general rose but from 2 to 5 per cent.

Rising living costs and a wage scale many points below are important indications that the asserted "fictitious prosperity" of France is no myth. Actually, the living cost index in the Paris district has risen to 626 as against 615 at the end of April last. It is here that the chief, at least the largest, output of the transforming metal industries are located.

The last report of the Comité des Forges—the French Metallurgists' Association—states, however, that industrial raw materials have remained practically stationary for the last twelve months. Unfortunately, the case is not the same for manufactured goods or for semi-fabricated materials.

The domestic consumption of steel was 66 per cent of production in 1926, but fell to 53 per cent in 1927, to rise again to 60 per cent in 1928. This today may be accounted for in two ways—the falling off in exports of steel manufactures and the increase in imports of like goods from abroad, taking it for granted that home consumption has followed normal lines.

Monsieur Citroen's report, as president of the Automobile Constructors' Association, states that the annual French production is now 250,000 units—833 cars per day for 300 working days. If, as Monsieur Citroen asserts, France is to have ultimately a registration of 3,000,000 automobiles in circulation (1 to each 13 of the population instead of 1 to 38 as now), far more efficient machine production methods in general will be called for.

Of touring cars France exported 1,746 units in the first three months of 1929 and imported 10,777. Of commercial motor vehicles the figures were respectively 44 and 1,960. Of the two classifications, exports have fallen off successively since 1927. It is evident, however, that commercial vehicle production is increasing in a possibly unlooked-for manner. These plants themselves will sooner or later have to get in line with new machine equipment if their product is to keep pace with world competition. Exports of motorcycles and bicycles have largely increased, likewise imports of the former. It is to be inferred from available statistics that the latter category is largely one of production assembly of parts which in no inconsiderable proportion come from abroad, chiefly from Great Britain and Germany.

If the Spanish-Italian accord comes to pass, Italy can furnish her machines and fabrications of metal—including automobiles, of which the export is considerable—in exchange for the raw materials with which Spain is more generously endowed—lead, copper, and the Rubio iron ores and coal, for instance. No less a person in France than Monsieur Le Trocquer, a former cabinet minister, predicts the possibility of a European customs union as the only answer to the free trading of the American states between themselves and the protectionism which he sees as launched especially against European industrial countries. He claims this European economic interdependence as being quite logical as a means of bringing America to terms. He probably ignores the fact that if such interdependence comes into being it will most decidedly not bring America to terms but will open an era of commercial warfare such as the world has never known. The answer for America, if actually it suffers thereby, will be to erect production plants throughout Europe, as have General Motors, Ford and the International Harvester Co.

Machine-tool makers here profess to be booking orders to their satisfaction for the production campaign of next season. There has been remarkable progress cited in machinery production in Alsace since that province has come back to the French fold, in direct competition though it is with the older French firms. The Graffenstaden Locomotive Works in Alsace alone has produced during its career 3,000 locomotives.

Second-hand machine tools are being offered at prices which naturally affect the sale of first-hand products. German offers in this market are still a handicap to local industry by reason of attractive prices and equally interesting credit terms. Concommittently, they can but affect American sales as well.

Small tools and precision tools are in but slight demand except for public service shops. The demand for quality, trade-marked products, whether of national or foreign tools, is increasing over that for ordinary types.

It has come to notice that the largest French distributor of American machine tools has recently divided the sales area of France into ten distinct districts, each with its own agent, with the resources of the parent organization at Paris at its disposal. This can but mean that there are many small, diversified metal-transforming industries scattered throughout France that are potential buyers of American machine tools which, up to the present, have been if not ignored or neglected at least slighted in favor of more concentrated efforts in the highly centralized industries of the intensive production districts.

Railway rolling-stock manufacturers have important orders in hand for steel passenger equipment and there is a rumor current of the possibility of an international cartel of manufacturers which will combine the various rolling-stock plants of Germany, Belgium, France and Czecho-Slovakia.

American Tariff Criticized

The American tariff revision is causing no end of critical comment throughout Europe, in France no less than elsewhere, Germany alone being notable by contrast as playing the soft pedal. The United States of Europe—as an economic entente at any rate—may yet come into action if the European manufacturer finds the American market virtually closed to him as is feared. This raises the question as to whether the Latin countries will, or can, work with the Nordics, even on this issue. Certainly such a combination would pretty much cover the gamut of necessaries and many of the adaptable luxuries of life in the case of free trading among themselves and the dangerous one which should be foreseen and considered from all angles. The possibilities are really not so vague as might at first be thought. There is, moreover, a sort of customs union being discussed between the Latin countries themselves with a likelihood of something real being brought about—using the good offices of the League of Nations at Geneva—between Italy and Spain. The question may well be raised as to the desirability of France becoming a part of such a tri-partite alliance.

French imports for the first four months of the year increased 2,500,000,000 francs and exports diminished 1,250,000,000 francs. Imports from the United States showed the biggest increase (600,000,000 francs), but there were increases from Great Britain, Germany, Canada, Switzerland and Belgium. Exports to the United States decreased 10,000,000 francs and also decreased to Great Britain, Germany, Belgium and Switzerland. Exports to French colonies increased slightly as did imports therefrom.

BUSINESS BAROMETER

Business outlook is complicated by the stock market and unsettled conditions, but most industries maintain high levels

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

THE boom in the stock market has now persisted so long that many have come to regard it as a permanent feature of our economic situation. Hence, it is not surprising that the daily newspapers emphasize the advances that are recorded from day to day in some of the speculative favorites, including the rails. But it has ceased to be a market in which everything goes up, and it is worth noting that some stocks are selling at less than half their 1929 high prices, and that there are approximately 250 issues quoted at from 20 to 50 points under their high for this year. These facts are disclosed in an analysis prepared by the stock exchange firm of Prince & Whitely. It shows that even among the leaders which figure in the industrial averages there are a few which have failed to rally much from the low of the year.

An appreciation of this fact, and the sobering effect of the persistently high rates charged for call money are probably responsible for the comparative quietude that prevailed on the Stock Exchange last week. The decline in prices was not important, but there seemed to be less enthusiasm and activity. It is possible that the vacation season is responsible for the change in the aspect of the speculative markets, and it might be well to await the opening of the autumn before committing oneself to any definite conclusion regarding the future.

The business outlook has been further complicated by reports of serious damage to the wheat crop in the United States and Canada, and an excited advance in wheat futures, despite the excessive carryover from the old crop and the enormous supplies that are now available in the terminal markets out of this year's winter wheat harvest. Some of the Federal Farm Board officials are represented as doubting that the organization of the Board has had much to do with the advance. Nevertheless the Board is "in conference" on the wheat situation and the bears, if there are any, catch the danger signal. The attitude of the Farm Board toward the problem that faces the Florida growers of citrus fruit reveals the methods by which it will undertake to extend farm relief. The Board urged the consolidation of the co-operative marketing associations involved, and promised them funds when they had agreed upon a unified program.

The cotton market has also been going up and down. As the week ends it is down from the recent top on news of needed rains in Texas, but the weather will continue to be the controlling factor for some weeks, and a recovery may be seen at any time.

The cotton situation now is seriously complicated by the problem of Southern delivery that confronts it, and it is plain that the forward business contracted for is smaller than for many years. Whether the effect will prove to be bullish or bearish remains to be seen.

In the other staple commodity markets, the week has been one of considerable activity, but the price changes have not been important. The rubber market is holding its own, but the bulls are hesitant because there seems to be an over-accumulation of tires, and price cutting is threatened.

In the industrial field the only change that calls for comment is a slight lessening in the demand for steel and iron. It may be seasonal, and should not be seriously regarded unless it persists. Production has not been appreciably reduced.

Distributive trade, as indicated by most of the available data, is excellent. Of course, it is not to be expected the midsummer business will be equal to that of the autumn, but it is very good, and everyone seems to have plenty of money to spend.

Another rise in brokers' loans to a new high diminishes hope of easier money rates, but the Reserve Banks are expected soon to begin buying bills to meet the fall demand for commercial credit, and no fear of "dearer" money is discoverable.

Labor troubles are reported here and there, but none of them are serious, and the strike of the New York clothing makers has been settled. A persistent effort to unionize the operatives in the Southern cotton mills is being made, but it seems to lack both money and support, and its success is unlikely.

The news from the Far East is also satisfactory, as Russia and China have agreed to talk it over, and the danger of war is averted. President Hoover's action in suspending work on the cruisers that were in process of construction, as well as his efforts to reduce our military budget, have had a profound effect upon public sentiment here and abroad, and the cause of peace has been greatly aided by the de facto support thus given. Of course, flaws are to be discerned here and there in the politico-economic conditions which now exist, but taken as a whole, they are more satisfactory than they have been for years, and they ought to have a beneficial effect upon business as soon as the capital now tied up in stock speculation is so re-distributed that it will be available to industry and trade.

From this page the reader will get a quick picture of current business and industry. The boxed material below is a summary of the letters from regional correspondents of the American Machinist, published in full on the opposite page.

LITTLE change has taken place in the machine tool sales during the past week. While some sections report seasonal let-ups, others, notably New York and Chicago, report an unusual business.

NEW YORK bids fair to have a record-breaking summer. Several dealers have gone ahead of the June record with General Electric the outstanding buyer. Chicago reports business as holding up well, with the month better than it has been during recent years. There is no improvement in deliveries in view. Cincinnati sales are holding up, in some cases being better than they were last month. In Philadelphia, the situation is described as "spotty," with basic conditions favorable, but the mid-summer lapse in evidence. Buffalo reports a quantity of small orders, with the month appearing to be one of the best Julys in history, and the feeling prevalent of a good autumn.

NEW ENGLAND is in the throes of a "spotty" recession, with good inquiries, and airplane manufacturers and engine builders maintaining their activity. Grinders, automatics, turret lathes and radial drills are in demand. July sales are about the same as June sales in Cleveland. Milwaukee reports slowness in delivery on milling machines and large equipment, and production as continuing at its former high rate. In Detroit, there are few large orders, but there is no indication of a serious summer depression. Automotive buying presages many changes in body and engine design.

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THE INDUSTRIAL REVIEW

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

BUFFALO

A quantity of small orders continue to make business interesting for the machine tool dealers in this district despite the fact that the vacation season is here and things are supposed to slow up. This means that there is every indication that July will prove to be one of the best mid-summer months in the history of the business in the Niagara frontier district. It reflects the general prosperity which seems to be prevalent in the widely-diversified industries of this region.

In the electrical equipment line practically the same condition prevails, or one which is at least parallel to it. Undoubtedly, considerable electrical equipment is going into the steel business locally within the next few months.

There are constant rumors of further expansion in the aircraft industry here. Most of them are justified, although it is unlikely that there will be any further material developments until late August or early September. The feeling is growing among equipment salesmen and sales managers that this is going to be an extraordinarily good autumn for business—moreover, that it will open up early.

MILWAUKEE

Manufacturers of milling machines and large equipment are still the same distance behind orders, which, with inquiries, continue to come in in undiminished volume, but these manufacturers are expecting the present rush to relax slightly before the summer is past. In many cases, delivery of heavy equipment to local concerns is still considerably slower than was either promised or anticipated. The metal-working industries are producing at the recent high rate and continue to complain of being hampered by a shortage of labor as well as needed equipment.

Machine tool orders from the smaller plants continue in a little less volume than they have recently, but orders from the larger concerns have fallen off almost to the extent which is usual at this season. Inquiries from the big buyers, however, indicate that they will be in the market again in the early fall. Plants manufacturing specialties for the automotive trade have felt some signs of abating demand, while automobile production in Wisconsin has been considerably curtailed. Production has not fallen off among the makers of airplane equipment, manufacturers of all lines of power and heavy transmission machinery, woodworking equipment, and farm implements.

Railway demand has not been felt much up to this time but inquiries from this source are satisfactory and promise the entry of the companies into the market before the close of the year. The expected transfer of the principal car building operations of the Chicago, Milwaukee, St. Paul & Pacific R.R. Co., to Milwaukee with the erection of large new shops will enlarge the local market considerably.

PHILADELPHIA

A few orders for some small equipment, mostly from general industrial lines, were received by Philadelphia manufacturers and dealers in machinery and machine tools during the last two weeks. The situation was described as spotty by most of the leaders of the industry, who described basic conditions as favorable, and who expressed the belief that the decline from recent activities is due to the mid-summer season.

One manufacturer of ball bearings reported a brisk demand for that product from the automotive trade and from aircraft producers, with the factory working night and day. Another producer of twist drills said there have been some orders from railroad companies in the East, and some sales have been made to machine shops. A few orders came from industrial establishments for lathes. The rest of the buying was virtually negligible in this territory throughout the past fortnight.

CINCINNATI

The great majority of the machine tool manufacturers in the Cincinnati district report that sales held up in an excellent way during the past month, and in some cases it was stated that the volume of business booked was larger than the volume in the preceding month. Taking the industry as a whole, the demand was good during the past week, it being in excess of the expectations for the season. A very slight slowing-up was reported by a small number of concerns, but this was by no means the general experience.

Selling agents report that business held up well during the week in local and adjacent territory. No large orders are reported by this branch of the trade, it being stated that the purchase of single tools and replacements continued to be the market feature.

Manufacturers report the week's business was sustained at a good level by the sale of single tools and replacements. The principal tool buyers and inquiries were general machinists and miscellaneous users, located in all sections of the country, whose requirements were well diversified in the matters of sizes and types. Scattering orders and inquiries from railroads and concerns in the automotive field called for single tools and replacements. Orders now booked, it is stated, will keep plants busy during the summer, and, therefore, manufacture will continue at a good level, even if there should be a falling off in sales.

NEW ENGLAND

The New England machine tool market, while showing recessions in spots, continues active well above the seasonal average. A good inquiry list and a large number of orders for single units are reported by most manufacturers. Turret lathes and radial drills are conspicuous among orders and inquiries. The Worcester section is active with a notable and unceasing volume of orders for grinding machines. Full schedules are the rule and shipping is heavy without any great impression on deliveries.

New England territory is keeping above normal activity through advance buying on the part of airplane manufacturers and airplane-engine builders. The New England Council finds, after a recent survey, that there are ten times as many concerns manufacturing or contemplating the manufacture of airplanes as there was a year ago. A total of 175 plants are making parts, supplies and accessories for the aeronautical industry.

The radio and electrical trades are also buying strongly, and are including a good volume of small automatics among their orders. July sales of machine tools here are anticipated below the June volume, but should be well above the average July since the war.

CLEVELAND

In general, the local machine tool market remains in a spotty condition. A few declines in sales are noted, but this loss is partly attributed to the absence on vacations of various officials. Scattered orders for single machines have helped to hold up the volume of business in this market for the past two weeks. Buying by the automotive industry is declining steadily and very little business is expected from this scource until late in the fall.

Dealers handling automatic machines, turret lathes and punch and shear lines report a fair business and that inquiries are holding up. July sales averaged about the same as those in June.

CHICAGO

Business volume in machine tools for July will fall little short of that reported for June, according to reliable accounts. Manufacturers' representatives and district agents with few exceptions state that the high level maintained during the month up to the present week has scarcely had a precedent for the last several years. Not in every line of tool production has this continued activity been noted, however. In a few cases, there has been a slight recession, mainly in heavy-duty tools, due, it is said, to seasonal conditions. Taken altogether, the market has shown a surprising strength for mid-summer, and there seems to be no present indication of a falling off in August. The demand for portable electric tools is reported by the local representative of a large Eastern plant specializing in that line as greater than at any time during the present year, July leading in the number of orders booked.

Railroad buying shows some recession, although inquiries continue to be received for single tools, some of which are for replacement purposes. Builders of farm machinery who have been reported as preparing substantial lists, thus far have given no intimation as to when these will materialize. Used tools of standard make and in good condition are having a satisfactory sale.

No improvement is noted in deliveries, and from what can be gathered the situation will be without change until well toward the end of the year.

DETROIT

While few large orders for equipment are being obtained at the present time, a survey of the month of July shows that the machinery and machine tool trade in the Detroit area has not suffered greatly from the summer depression. Orders for small tools and for general replacement equipment have been fairy regular throughout the month and at no time has business dropped off seriously.

There is evidence here that the coming month will be a repetition of the past one,

although there are some deals in prospect that may change the face of things considerably. Thus far, these things have not been advanced sufficiently to be made public, but should the orders be placed, the level for August will probably compare favorably with the level for the better months of 1929.

The new Hudson straight-line eight has brought some fairly large orders and it is likely that more will follow. Packard is still buying some equipment for its new airplane motor plant and it is believed that a number of contract shops will be in the market for tools and diversified equipment.

The small shops have been receiving more business from the automobile and large parts manufacturers than is common for this time of year and there is reason to believe that this presages a period of many changes in motor and body design.

General business surveys taken in this area during the past month reveal an unusually heavy volume of business for the year thus far, and indicate also that conditions will be at least as good during the balance of the year. Automobile and accessory manufacturers and industrialists in general are almost unanimous in the belief that the balance of the year will uphold the pace set in the first seven months. Machinery dealers predict a favorable trend during the next four months.

NEW YORK

Orders and inquiries for machine tools and equipment continue to flow in to New York dealers and representatives in gratifying volume. A few firms report a falling off, due not to any slump in demand but merely to the summer vacation period. But others are establishing new high records of sales, with July even better than June, and this summer more active than last summer. Considerable plant expansion and increase of manufacturing capacity are occurring in the district. Industrial firms are earning good money, and are not afraid to spend some of it for new and improved machines that will, in turn, pay greater returns on the investment.

As has been the case during the past few months, practically every type of industry in the locality is on the market for new equipment. General Electric, Western Electric, and firms in the sheet-metal, machine tools, radio, bronze working, pump and elevator fields are placing good orders. Large and small plants are buying, and purchases cover a wide range of machines. Orders are usually for one or two units. No new large lists have come out. In other words, the business is unusually healthy and all firms are getter a share.

In addition to price raises of from 10 to 15 per cent on planers recently announced, the shaper price situation has become equalized by general increases, and one maker of lathes is raising his quotations 7½ per cent, effective August 1. Deliveries are getting a little worse, due to the piling up of orders at the plants, although many of the machine tool builders are still running three shifts. There will probably be no tendency for prospective buyers to wait for the machine tool exhibit in September before placing orders, especially if they will need equipment soon, because deliveries on orders placed at that time must necessarily run well into 1930.

Used machinery shares in the general activity. Demand is heavy, prices are up, deliveries are good, and all classes of industries are buying. Orders run to a small number of units each.

August is expected to fall off somewhat in total volume of sales, but when the orders now postponed because of vacation influences pile up in the fall, with the prevailing normal run of business, indications are that record-breaking six months will be registered in the district.

The Triplex Machine Tool Co. during the past week entered orders for: one 25-in. Fosdick upright drill; two General flexible power presses; one Index No. 0 screw machine; one Deckel universal miller; one bench filing machine; one Davis keyseating machine.

Tariff Decision Now with Senate Committee

By K. K. Hoyt
Washington Correspondent

With the close of the tariff hearings before the Senate Finance Committee last week, the last opportunity of industry to affect the tariff ended. The decision now rests with the committee, which is busy tearing up the House bill and fitting the pieces together into a new pattern. While no one is certain what the amended bill will contain, it is generally presumed that the changes will take a downward trend. The House rates, in the opinion of the committee, approached too closely the top-heavy provisions of the Payne-Aldrich act, which failed in 1912.

A step toward the solution of the valuation program was made when the Tariff Commission was instructed to translate all ad valorem or percentage rates into specific values or cents per pound. Most ad valorem rates are based now on foreign value, which is hard to check. This is claimed to lead to undervaluation to encourage the country of lowest production cost, and to offer the least protection when most needed. Substitution of specific rates would, it is claimed, remove these troubles and make customs collection much simpler.

* * *

Five Technical Groups to Meet at Cleveland, Sept. 9

Five leading technical groups will hold their annual meetings simultaneously in Cleveland during the week of Sept. 9, in connection with the National Metal Congress to be held there. The five societies are: the American Society for Steel Treating, the Iron & Steel Division of the A.I.M.E., the Institute of Metals Division of the A.I.M.E., the Iron and Steel Division of the A.S.M.E., and the American Welding Society. They have a combined membership of 15,000, and have 150 speakers listed for the various meetings.

Concurrently with the meetings of the groups, the Eleventh Annual Metal Exposition will be held in the Cleveland Public Auditorium, at which over 275 manufacturers will exhibit their latest equipment, supplies, and their newest processes and methods. The exhibits will cover some 80,000 sq.ft. of floor space. The National Metal Congress is under the direction of the American Society for Steel Treating.

* * *

Diesel Manufacturers Organize Association

Diesel engine manufacturers of the United States have recently organized the Diesel Engine Manufacturers Association, with headquarters at 30 Church St., New York City, in order to maintain closer contact among themselves and with the users of this type of engine. The association claims as its aims the advancement of Diesel power in America, and a broad program of co-operation with buyers.

Business Items

The Austin Motor Co., London, England, manufacturer of the Austin automobile, has recently purchased works in Butler, Pa., from the Standard Steel Co., and will soon begin the construction of the car in this country. The Austin has a 7-hp. engine, weighs about 950 lb. is slightly over 9 ft. in length, and is expected to retail for less than $500 in this country.

Cary & Co., Minneapolis, Minn., manufacturers of oil burners, oil-burning heating plants, humidifiers, and water heaters, have taken an option on the Acme Brass & Metal Works plant, Waupauca, Wis., with a view to reestablishing its main works at Waupauca. F. C. Cary is president of the company.

The American Eagle Aircraft Corporation, Kansas City, has purchased the Wallace Aircraft Co., Chicago, and will move the factory to Kansas City in the near future. Plans call for the construction of a new building, 300x100 ft., in the near future.

Western Steel Products has purchased a property and buildings previously occupied by the Western Stone Co., adjoining its plant in St. Boniface, Manitoba. The buildings will be demolished and a modern plant will be erected by Western Steel Products to take care of expanding business.

The Newton Steel Co. will begin operations in its new sheet mill in Monroe, Mich., about Sept. 1. The firm is also planning a bar mill and will begin work on the construction of this second unit in the near future, it is believed.

The Studebaker Securities Co., Chicago, has acquired half interest in the Chamberlain Machine Works, Waterloo, Iowa, and the company has been reorganized as the Chamberlain Corporation. Work will be started at once on a new building, 100x200 feet.

The Society of Automotive Engineers and the Aeronautical Chamber of Commerce of America will hold a joint aeronautic meeting at Cleveland, Aug. 26 to 28. Fourteen papers are listed on the preliminary announcement of the meeting.

The Fogle-Helsby Co. has been formed in Seattle, Wash., to deal in fabricated steel, and to handle the Northwestern territory for the Northern Engineering Works, Detroit; Ames Iron Works, Oswego, N. Y.; and Schwartz Engineering Co., Denver.

The John Deere Plow Works, Moline, Ill., recently resumed production after the three-week inventory shut-

down, the longer suspension being a result of the addition of new buildings and the readjustment of equipment for increased production. Workmen this year for the first time were on pay during the shutdown period. Operations were at capacity when inventory was started and the plants resumed full force.

The Union Twist Drill Co., Athol, Mass., has appointed the Pacific Mill & Mine Supply Co., Los Angeles, as dealer in that district. S. F. Sides has been appointed direct sales representative in the same district for the Union company.

The Porter-Cable Machine Co., Syracuse, N. Y., has purchased, and will continue to manufacture, the Emmert Oscillating Spindle Sander, formerly manufactured by the Emmert Manufacturing Co., Waynesboro, Pennsylvania.

The Olds Motor Works, Lansing, Mich., will soon begin construction of a new service parts building, it has been announced by I. J. Reuter, president and general manager. The building will be 420x130 ft., three stories in height.

The Universal Power Shovel Co., a division of the Unit Corporation of America, 5323 Burnham Street, Milwaukee, is building a brick and steel shop extension, 100x225 ft., estimated to cost $100,000.

The American Foundry Co., Bay Point, Wis., has purchased the Dow Pump & Diesel Engine Co., Alameda, Calif., and will move to that location after the installation of new equipment. A. Searle is general manager.

The Reliance Machinery Sales Co., 1407 Brighton Road, Pittsburgh, Pa., has been appointed distributor of the "New Model" South Bend lathes for the Pittsburgh territory by the South Bend Lathe Co., South Bend, Indiana.

The Valley Forge Steel & Tool Co., manufacturer of tool steels and metal-working tools, has bought the property located at Monroe and Jefferson Streets, Chicago, and will have it altered immediately for their use.

The Acoustics Products Co., New York, recently assumed control of the Federal Telephone Manufacturing Co., Buffalo, and will continue to manufacture several types of radio equipment there.

The Fusion Welding Corporation, Chicago, has taken over the sale of all welding rod manufactured by the Chicago Steel & Wire Co., which owns the corporation outright.

The National Automotive Parts Association will hold its annual fall convention in Detroit from Nov. 6 to 8. Headquarters for the convention will be at the Hotel Statler.

The Frost Gear & Forge Co., Jackson, Mich., has been merged with the Clark Equipment Co., Buchanan, Mich. The Frost Co. has been engaged in the manufacture of automobile parts and has been selling a large part of its output to the Clark company.

The Rudel-Ryder Machinery Co., Ltd., Toronto, Ont., has been appointed sales agent for the province of Ontario by the Geometric Tool Co., New Haven, Connecticut.

The Lusch-McDonald Furnace Co., 944 North High St., Columbus, Ohio, has purchased the Columbus branch of the Hart & Crouse Furnace Co., Utica, N. Y.

The American Metallurgical Corporation, Boston, has changed its name to the American Electric Furnace Co. The personnel of the company remains unchanged.

The Aerotrus Products Corporation, Los Angeles, Calif., has purchased the assets of the Largent Co., Los Angeles. W. E. Marchant is president of the company.

The Cincinnati Shaper Co. has just completed new and larger quarters for the executive department of the company.

The Cincinnati Milling Machine Co. closed its plant during the week of June 1 to give the workers their annual vacation.

The Bell Machine Co., Oshkosh, Wis., will build a 2-story shop addition in the near future.

The Carleton Machine Tool Co., Cincinnati, is completing a 200x150-ft addition to the present plant.

The Giddings & Lewis Machine Tool Co., Fond Du Lac, Wis., is building a $100,000 shop addition.

The Chevrolet Motor Co., Flint, Mich., has begun construction of a 375 x248 ft., metal-stamping plant.

Personals

HERBERT F. PERKINS has been elected president of the International Harvester Co., to succeed Alexander Legge, who resigned to become chairman of the Federal Farm Board. He has served with the company for 31 years in various capacities. ARTHUR REYNOLDS has been elected a director of the same company to succeed Robert P. Lamont.

J. W. DRAKE of the Hupp Automobile Co., Detroit, has been appointed chairman of a delegation to represent the United States at the Pan-American Highway Congress in Rio De Janeiro in August. H. H. RICE, of the General Motors Corporation, Detroit, has also been appointed a member.

CHARLES E. EVELETH, former vice-president jointly in charge of the manufacturing department of the General Electric Co., has been transferred to the engineering department of the same company, and will become vice-president jointly in charge of that department.

WALTER E. STUMP, for several years in the manufacturing business in Danville, Ill., has taken over manufacture of a new headlight adjuster and incorporated the Stump Manufacturing Company, 132 North Walnut Street, for its production and distribution.

Obituaries

WILLIAM T. HARMON, former assistant treasurer of the United Shoe Machinery Corporation, Boston, died recently in that city at the age of 67. He was formerly secretary and treasurer of the Ross Moyer Manufacturing Co., which became western representative for the United Corporation following formation of the company in 1899.

T. E. MURRAY, formerly in charge of the allied Edison companies in New York and Brooklyn, died at Southhampton, L. I., on July 21. Mr. Murray held 1,100 patents, and was second in this respect only to Thomas Edison.

WILLIAM HENRY LANE, retired machinery manufacturer, died at Beacon, N. Y., on July 18 at the age of 88.

Forthcoming Meetings

NATIONAL METAL CONGRESS. To be held in Cleveland September 9 to 13. Simultaneous meetings of the American Welding Society, the Institute of Metals Division, American Institute of Mining & Metallurgical Engineers, Iron & Steel Division, American Society of Mechanical Engineers, the Iron & Steel Division, A.I.M.E., and the American Society for Steel Treating. W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland, Ohio.

NATIONAL METAL EXPOSITION. Eleventh annual, held under the auspices of the American Society for Steel Treating, Cleveland Public Auditorium, Cleveland, Sept. 9-14. W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland.

AMERICAN RAILWAY TOOL FOREMEN. Annual convention at Hotel Sherman, Chicago, September 11 to 13. C. C. Ziegler, secretary-treasurer, 611 West Washington Blvd., Chicago.

MACHINE TOOL BUILDERS EXPOSITION. Under the auspices of the National Machine Tool Builders Association, Sept. 30 to Oct. 4, in the Public Auditorium, Cleveland, Ohio. Ernest F. DuBrul, general manager, 1415 Enquirer Bldg., 617 Vine St., Cincinnati.

SOCIETY OF INDUSTRIAL ENGINEERS. Sixteenth national convention at Hotel Statler, Cleveland, October 23 to 25. Requests for programs should be sent to S.I.E. national office, 205 West Wacker Drive, Chicago.

THE WEEKLY PRICE GUIDE . . .

Rise and Fall of the Market

STEEL is being taken in unprecedented quantities for this season of the year, by all major consuming lines except automotive and railway. Shapes, plates, bars, sheets and pipe are most active, with slowing-down noted in shop supplies, such as bolts, nuts and rivets. Steel prices hold to quoted levels. Nonferrous metals do not show the price steadiness evinced by steel. Tin, solder and babbitt metal rose this week at New York warehouses, while lead declined. Scrap brass and lead are lower in Chicago. Linseed oil advanced 0.2c. per lb. to 13.7c. at Chicago.

(All Prices as of July 25, 1929)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b:

CINCINNATI	
No. 2 Southern (silicon 1.75@2.25)	$18.44
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 1.75@2.25)	20.75
BIRMINGHAM	
No. 2 Foundry (silicon 1.75@2.25)	14.50
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.76)	21.76
Virginia No. 2	24.79
Basic	20.76
CHICAGO	
No. 2 Foundry local (silicon 1.75@2.25)	20 00
No. 2 Foundry, Southern (silicon 1.75@2.25)	20.76
PITTSBURGH, including freight charge ($1.76) from Valley:	
No. 2 Foundry	19 76
Basic	19.26
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb:

Detroit	4.50
Cleveland	5.00
Cincinnati	4.50
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

Blue Annealed*	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.20@2.35	3.35	3.30	3.90†
No. 12	2.25@2.40	3.45	3.35	3.95†
No. 14	2.35@2.50	3.55	3.45	4.00†
No. 16	2.45@2.60	3.65	3.55	4.10†
Black				
Nos. 18 to 20	2.65@2.75	3.85	3.70	3.80
No. 22	2 80@2.90	4.00	3.85	3.95
No. 24	2.85@2.95	4.05	3.90	4.00
No. 26	2.95@3.05	4.15	4.00	4.10
No. 28	3 10@3.20	4.75	4.15	4.25
Galvanized				
No. 10	2.80@2.90	4.20	4.05	4.05
Nos. 12 to 14	2.90@3.00	4.30	4.15	4.15
No. 16	3.00@3.10	4.40	4.25	4.25
No. 18	3.15@3.25	4.55	4.40	4.40
No. 20	3.30@3.40	4.70	4.60	4.55
No. 22	3.35@3 45	4.75	4.65	4.60
No. 24	3.60@3 70	4.90	4.75	4.75
No. 26	3 75@3.85	5.15	5.00	5.00
No. 28	4.00@4.10	5.40	5.25	5.25

*Light plates. †Up to 3,999 lb

WELDED STEEL PIPE—Warehouse discounts are as follows

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Glav.
1 to 3 in., butt welded	50%	36%	55½%	43½%	54%	41%
2½ to 6 in., lap welded	45%	32%	53½%	40½%	51%	38%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	—Diameter in Inches— External	Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb:

— Thickness — Decimal Fractions	B.w.g. and	Outside Diameter in Inches ⅛	¼	⅜	½	¾	1	1¼	1½
		Price per Foot							
.035″	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23	
.049″	18	.17	.18	.19	.20	.21	.23	.25	
.065″	16	.19	.20	.21	.22	.23	.25	.27	
.083″	14	.20	.22	.23	.24	.25	.27	.29	
.095″	13	.21	.23	.25	.26	.27	.29	.31	
.109″ .120″ or	12	.22	.24	.26	.27	.28	.30	.32	
.125″	11	.23	.25	.27	.28	.29	.31	.33	
.134″	10	.24	.26	.28	.29	.30	.32	.34	

MISCELLANEOUS—Warehouse base prices in cents per lb:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.25†	4.00	4.15
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10†	5.30	5.00
Cold drawn, round or hexagon‡	3.60	3.65	3.60
Cold drawn, flat or square‡	4.10	4.15	4.10
Structural shapes	3.30†	3.00	3.10
Soft steel bars	3.25†	3.00	3.00
Soft steel bar shapes	3.25†	3.00	3.00
Soft steel bands	3.75†	3.65	3.65
Tank plates	3.30†	3.00	3.10
Bar iron (2.75 at mill)	3.25	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, $\frac{3}{16}$-in. thick. †Up to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire at New York warehouse— $\frac{3}{32}$, 8.35c. per lb; $\frac{1}{8}$, 7.85c. per lb.; $\frac{5}{32}$ to $\frac{1}{4}$, 7.35c. per lb.

METALS

Warehouse Prices in Cents Per Pound for Small Lots:

Copper, electrolytic, New York			19.25
Tin, Straits, pigs, New York			49.00
Lead, pigs, E. St. Louis	6.55	New York	8.00
Zinc, slabs, E. St. Louis	6.80	New York	8.25

	New York	Cleveland	Chicago
Antimony, slabs	11.00	12.25	14.25
Copper sheets, base	27.75	27.75	27.75
Copper wire, mill, base	19.87½	19.87½	19.87½
Copper, drawn, round, base	26.25	26.25	26.25
Copper tubing, base	29.25	29.25	29.25
Brass sheets, high, base	23.25	23.25	23.25
Brass tubing, high, base	28.25	28.25	28.25
Brass rods, high, base	21.25	21.25	21.25
Brass wire, high, base	23.75	23.75	23.75

SHOP MATERIALS AND SUPPLIES

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%.....	33.25*	24.30	24.30
Zinc sheets (casks).....	10.50@11.00	11.70	10.11
Solder (½ and ½).....	33.50	32.75	31@34
Babbitt metal, delivered in case lots, New York, cents per lb:			
Genuine, highest grade.....			64.00
Commercial genuine, intermediate grade.....			47.00
Anti-friction metal, general service.....			31.50
No. 4 babbitt.....			11.75

*Delivered.

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va:

	Nickel	Monel Metal
Sheets, full finished.....	52.00	42.00
Sheets, cold rolled.....	60.00	50.00
Strip, cold rolled.....	55.00	45.00
Rods, hot rolled.....	45.00	35.00
Rods, cold rolled.....	53.00	40.00†
Tubing	75.00*	90.00
Angles, hot rolled.....	50.00	40.00
Plates.....	52.00	42.00

*Seamless. †Cold drawn.

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars, depending on quantity offered for sale:

	New York	Cleveland	Chicago
Crucible copper.....	15.25 @15.50	13.50	13.00 @14.00
Copper, heavy, and wire..	14.00 @15.25	13.00	12.00 @13.00
Copper, light, and bottoms	12.50 @13.25	12.50	11.00 @12.00
Heavy lead.....	5.12½@ 5.37½	6.25	4.75 @ 5.25
Tea lead.....	3.50 @ 4.00	4.25	3.75 @ 4.25
Brass, heavy, yellow.....	8.50 @ 9.00	8.00	8.00 @ 8.50
Brass, heavy, red.....	.....	12.50	11.75 @12.25
Brass, light.....	7.00 @ 7.50	7.50	7.00 @ 7.50
No. 1 yellow rod turnings.	9.50 @10.00	9.00	9.00 @ 9.50
Zinc.....	3.25 @ 3.50	3.25	3.00 @ 3.25

TIN PLATES—Charcoal—Bright—Per box:

	New York	Cleveland	Chicago
"AAA" Grade:			
IC, 14x20.....	$12.10	$11.95	$11.50
"A" Grade:			
IC, 14x20.....	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20.....	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20.....	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.*	$0.10@0.13½	$0.16	$0.15
Cotton waste, colored, per lb.*	.09@ .13	.12	.12
Wiping cloths, washed white, per lb.†.....	.16	38.00 per M	.16
Sal soda, per lb.....	.02½	.02	.02
Roll sulphur, per lb.....	.027	.03½	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.....	.133	.11	137
Cutting oil, about 25% lard, in 5 gal. cans, per gal.....	.75	.60	.65
Machine oil, medium-bodied (55 gal. steel bbl.) per gal..	.33	.36	.35
Belting — Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c. per lin. ft., per inch of width, for single ply:			
Medium grade.....	30–10%	30–10%	35%
Med. grade, heavy wgt...	30– 5%	30– 5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft:			
First grade.....	50%	50–10%	50%
Second grade.....	60%	60– 5%	50–10%

*All waste in bale lots. †100-lb. bales.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars.....	per lb..	$0.0325	$0.0325	$0.0325
Cold drawn shafting...	per lb..	.036	.035	.034
Brass rods.....	per lb..	.2125	.2125	.17
Solder (½ and ½).....	per lb..	.335	.3225	.31
Cotton waste, white...	per lb..	.10@.13½	.10@.13½	.10@.13½
Disks, aluminum oxide mineral, cloth, No. 1, 6-in. dia.....	per 100.	3.60	3.60	3.10
Lard cutting oil.....	per gal.	.75	.75	.65
Machine oil.....	per gal.	.33	.33	.30
Belting, leather, medium.....	off list..	30–10%	30–10%	30–10%
Machine bolts, up to 1x30 in., full kegs...	off list..	50-10%*	50–10%*	50%*

*List prices as of April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper.....	$4.50	$4.29	$4.29
Emery cloth.....	22.93	20.97	20.97
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper.....	2.64	2.04	2.04
Cloth.....	3.60	3.59	3.59
Fire clay, per 100 lb. bag.....	1.00	.75	.75
Coke, prompt furnace, per net ton...	Connellsville,		3.00@3.50
Coke, prompt foundry, per net ton...	Connellsville,		4.00
White lead, dry or in oil...	100 lb. kegs....	New York,	13.75
Red lead, dry.....	100 lb. kegs....	New York,	13.75
Red lead, in oil.....	100 lb. kegs....	New York,	15.25

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

Machine bolts:	
Up to ¾-in. x 6-in., full kegs, list less.....	60%
Larger, up to 1 x 30-in., full kegs, list less.....	50–10%
Less than full kegs or case lots, add to list.....	10%
Fitting-up bolts: list less.....	45%
Lag screws:	
Up to ½-in. x 6-in., list less.....	60%
Larger, list less.....	50–10%
Less than full keg or case lots, add to list.....	10%
Rivets:	
Structural, round head, full kegs, net.....	$4.50
Structural, round head, broken kegs, net.....	6.00
Tank, ⅞-in. dia. and smaller, list less.....	60%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped:	
Full kegs up to 1-in., incl., list less.....	60%
Larger, up to 3-in., list less.....	40–10%
Less than keg or case lots, add to list.....	10%
Washers:	
Wrought, full kegs, per 100 lb., list less.....	$4.00
Wrought, broken kegs, per 100 lb., list less.....	2.00
Turnbuckles:	
With stub ends, list less.....	20%
Without stub ends, list less.....	50%
Chain:	
Proof coil, base, per 100 lb., net.....	$7.10
Cast iron welding flux, per lb., net.....	.40
Brazing flux, per lb., net.....	.80

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Equipment Wanted

Calif., Alameda—W. G. Paden, secy. Bd. Educ., takes bids Aug. 6, shop equipment and machinery for school department.

Ill., Streator—Anthony Co. (dump bodies for Ford cars)—overhead traveling crane for proposed 1 story, 60 x 300 ft. factory.

Mass., Boston—Gerald Electric Co., 92 Pearl St., d.c. and a.c. electric motors, blowers, machine tools, etc.

Mass., Reading—J. C. Birchall, 7 Sanborn St.—milling machine and shaper.

Mich., Ferndale—The Forging & Steel Corp., c/o The Austin Co., 11-205 General Motors Bldg., Engrs.—equipment for the manufacture of tool steel for proposed 1 story factory on Wanda Ave. Estimated cost $50,000.

Mich., St. Joseph—Auto Specialties Co.—electric furnace, conveyor system and equipment for proposed 1 and 3 story factory. Estimated cost $750,000.

Tex., Brownsville — Pan-American Airways, Inc., G. L. Reil, V. Pres.—machinery and equipment for general repairing for proposed 1 story, 120 x 120 ft. airplane shop.

Tex., San Antonio—Alamo Aircraft Corp., c/o B. Hammond, equipment for aircraft manufacture, for proposed plant. $200,000.

Tex., San Antonio—Texas Air Transport, Grosvenor Field, subsidiary Aviation Corp., 122 East 42nd St., New York, taking bids machinery, equipment and construction airport plant, incl. machine shop, hangars, etc. Estimated cost $500,000.

Ont., Preston—Canadian Office & School Furniture Co., 195 King St., special woodworking equipment, for proposed 4 story, 70 x 100 ft. factory addition, King St. Estimated cost $60,000.

Ont., St. Catharines — General Motors Ltd, Oshaw—equipment for the manufacture of electrical parts, and equipment, transmission shock absorbers and axles to cost $500,000 for proposed plant here.

Ont., Toronto—Hamilton Bridge Co., Hamilton, wants prices on equipment for proposed branch factory, at waterfront, here. Estimated cost $100,000. Private plans.

Opportunities for Future Business

Calif., Berkeley — University of California, plans the construction of first unit of college building including electrical and mechanical departments. Estimated cost $685,000. G. W. Kelham, 315 Montgomery St., San Francisco, is architect.

Calif., Los Ange'es—Hollywood Casket Co., 1024 Orange Dr., is having plans prepared for a 2 story, 88 x 200 ft. factory. Estimated cost $50,000. Pope & Burton, 404 Beaver Arts Bldg., Archts.

Calif., Los Angeles—Los Angeles Brush Co., 2208 East 37th St., is having plans prepared for a 1 and 2 story, 105 x 110 ft. factory. R. D. King, Van Nuys Bldg., Archt.

Calif., Los Ange'es — Standard Auto Body Works, 15th and Central Ave., is having plans prepared for a 1 story, 97 x 150 ft. shop, also 50 x 80 ft. addition to paint shop at 15th St. and Central Ave. R. D. King, Van Nuys Bldg., Archt.

Conn., Bridgeport—Bassick Co., 33 Austin St., manufacturers of casters, plans the construction of a factory. Estimated cost $40,000. Architect not selected.

Conn., Bridgeport — Chevrolet Co., c/o Fletcher-Thompson Inc., 542 Fairfield Ave., is having plans prepared for the construction of a sales and service station. Estimated cost $100,000.

Conn., East Hartford (br. Hartford)—Pratt & Whitney Aircraft Co., 450 Capital Ave., Hartford, awarded contract for foundation of a 2 story, 400 x 1,500 ft. airplane factory here. Estimated cost $2,000,000.

Conn., Hartford — Liner Atwell Co., 60 Bartholomew Ave., awarded contract for a 2 story, 50 x 100 ft. sheet metal factory. Estimated cost $50,000. Noted July 25.

Conn., Noroton—Bd. of Finance, State House, Hartford, will soon award contract for a 2 story, 40 x 140 ft. service building, including carpenter, plumbing and electric shops, etc., here, for Fitch Home for Soldiers. Estimated cost $90,000. **Payne & Keefe**, 231 State St., New London, Archts.

Ill., Chicago—W. E. Belke, 2948 West Van Buren St., manufacturers of electro plating specialties, awarded contract for a 1 story factory and office.

Ill., Chicago—Black Products Co., 13516 Calumet Ave., manufacturers of foundry products, awarded contract for a 4 story, 55 x 63 ft. addition to factory.

Ill., Chicago — Economy Machine Products Co., awarded contract for a 1 story, 60 x 92 ft. addition to plant at 5208 Lawrence Ave.

Ill. Chicago—Jensen Radio Mfg. Co., 6601 South Laramie Ave., awarded contract for addition to plant. Noted Mar. 14.

Ill., Chicago—Goodman Mfg. Co., 4834 South Holsted St., manufacturers of electric coal mining machinery, locomotives, coal cutters, etc. awarded contract for a 1 and 4 story, 58 x 73 ft. addition to factory. Estimated cost $60,000.

Ill., Chicago—Superior Tool Works, 12 South Clinton St., manufacturers of dies and tools, awarded contract for a 1 story, 100 x 125 ft. factory at 4519 Haddon St. Estimated cost $30,000.

Ill., Chicago — Western Electric Co., Hawthorne Station, awarded contract for a 1 story, 90 x 120 ft. addition to factory at 4501-59 West 22nd St. Estimated cost $65,000.

Ill., Chicago—Western Screw Co., 4413 West Kinzie St., awarded contract for a 1 and 2 story, 170 x 322 ft. factory for the manufacture of wood and iron screws at 3211-43 West 47th Pl. Estimated cost $150,000. Noted June 20.

Ind., Fort Wayne — Kunkle Valve Co., awarded contract for a 2 story, 60 x 150 ft. garage and service building at Washington and Clay Sts. Estimated cost $50,000.

Ind., Kokomo—Western Oil Co., 310 North Meridian St., Indianapolis, awarded contract for the construction of a machine shop and service station here. Estimated cost $42,000. Noted July 4.

Md., Baltimore—Guilford Realty Co., G. E. Saulsbury, St. Paul and Lexington Sts., will soon award contract for a 5 story, 56 x 186 ft. garage at 220 Guilford Ave. Estimated cost $155,000. Palmer & Lamdin, 513 North Charles St., Archts.

Mass., Boston—Schoolhouse Dept., will soon award contract for a 2 story, 65 x 140 ft. addition to school including shops, etc. J. M. Gray, 175 High St., Archt.

Mass., Cambridge (Boston P. O.)—C. J. Cox Engineering Co., 625 Putnam Ave., awarded contract for addition and alterations to shop.

Mass., Chelsea—Inter-Continental Pipe & Mining Co., H. Kennedy, Pres., 475 Fifth Ave., New York, is having plans prepared for the construction of a plant etc. on Eastern Ave. Estimated cost $3,000,000. Fay, Spofford & Thorndike, 44 School St., Boston, Engrs. Noted July 25.

Mass., Middleboro—Maxium Fire Engine Co., C. L. Maxium, Pres., manufacturers of fire ladders, apparatus and fire engines, will build a 3 and 4 story factory. Estimated cost $40,000. Noted July 25.

Mich. Detroit—Long Mfg. Co., 2768 East Grand Blvd., is having plans prepared for a 2 story, 128 x 400 ft. factory for the manufacture of automobile radiators on Dequindre St. Estimated cost $300,000.

Mo., Kansas City—Beacon Airway of America, Bd. of Trade Bldg., awarded contract for the construction of an airplane factory. Estimated cost $90,000.

Mo., St. Louis — Gardner Motor Co., R. E. Lynes Asst. Secy., Main and Rutgers Sts. and Parks Aircraft Mfg. Co., East St. Louis, Ill., plan to expend $2,500,000 for additions to plants at St. Louis and East St. Louis, Ill.

Mo., St. Louis—H. E. Foster, 400 West Madison Ave., New York, N. Y., Archt. and Engr., is receiving bids for the construction of assembly and service buildings at Jefferson and La Salle Sts. here for Mack-International Truck Co., 3300 Wentworth Ave., Chicago, Ill. Estimated cost $250,000.

N. J., Phillipsburg—Cameron Pump Works, will soon award contract for addition to plant. Estimated cost $250,000.

N. J., Secaucus—New York Air Terminal Inc., W. F. Carey, Pres., 44 Wall St., New York, will build an airport including hangars, machine shops, garages, etc. Estimated cost $8,000,000. Noted Apr. 11.

N. Y., Astoria—J. Goldberg, 1255 Park Pl., Brooklyn, will soon receive bids for an 87 x 134 ft. garage at Goodrich St. and Astoria Ave. here. Estimated cost $40,000. Cohn Bros., 363 Stone Ave., Archts. Noted July 11.

N. Y., Brooklyn—Brooklyn Borough Gas Co., Mermaid Ave. and West 17th St., will receive bids after Aug. 10 for the construction of a garage and shop at Nostrand Ave. and Shell Rd. Estimated cost $300,000. Black & Hess, 18 East 41st St., New York, Archts. Noted June 6.

N. Y., College Point (sta. Flushing)—Aero Supply Corp., is receiving bids for the construction of a 1 story, 50 x 137 ft. factory at 22nd St. and Third Ave. Estimated cost $40,000. P. Coco, 433 Steinway Ave., Astoria, Archt.

N. Y., New York—Ninety Fourth St. Holding Corp., 1619 52nd St., Brooklyn, plans the construction of a 4 story garage at 312 East 94th St. here. Estimated cost $125,000. W. Shary, 22 East 17th St., New York, Archt.

N. Y., New York—Third Ave. R.R., 2396 3rd Ave., will receive bids about Aug. 1 for the construction of a bus repair shop, paint shop, etc. Estimated total cost $40,000. E. H. Faile & Co., 441 Lexington Ave., Archts. and Engrs.

O., Cleveland—Lindsay Wire Weaving Co., H. L. Lindsay, Pres., 14025 Aspinwall Ave., had plans prepared for a 2 story, 49 x 122 ft. addition to factory. Estimated cost $50,000. Bohnard & Parsson, 1900 Euclid Bldg., Archts.

O., East Liverpool—Patterson Foundry & Machine Co., awarded contract for a 1 story factory. Estimated cost $150,000.

O., Youngstown—McKay Machine Co., R. L. Thomas, Treas., awarded contract for a 1 story, 34 x 104 ft. factory on Rayen Ave. Estimated cost $40,000. Noted July 11.

Pa., Dravosburg—Curtiss Airports Corp., c/o K. Franzheim, Madison Ave., New York, Archt., awarded contract for developing Bettis Field. This corrects report in July 25 issue.

Tenn., Nashville—Pirtchett-Thomas Co., 717 Stahlman Bldg., plans the construction of a 6 story, 100 x 175 ft. garage. Estimated cost $500,000. Marr & Holman, Stahlman Bldg., Archts.

Tex., San Antonio—Trust Co., c/o B. Hammond, c/o W. S. Forrester, Travis Bldg., plans the construction of a 2 story airplane manufacturing plant. Estimated cost $150,000.

Wis., Milwaukee—Milwaukee Electric Railway & Light Co., 217 Michigan St., awarded contract for a 1 story, 100 x 200 ft. repair shop at Cold Spring.

Wis., Milwaukee—Nordberg Mfg. Co., Chicago and Oklahoma Sts., awarded contract for a 1 story, 92 x 136 ft. erection shop.

Ont., Hamilton—Boston Insulated Wire & Cable Co. Ltd., plans a 40 x 60 ft. addition to factory.

Ont., Ridgetown—Bd. of Education, awarded contract for the construction of a vocational school including machine shop, etc. on King St. Estimated cost $100,000.

Ont., Toronto—See & Duggan, 621 Yonge St., will soon receive bids for a 2 story, 114 x 123 ft. garage etc. on Irwin Ave. Estimated cost $175,000. Mathers & Holdenby, 96 Bloor St. W., Archts.

Ont., Windsor—Chrysler Corp. of Canada, 300 East Tecumseh Rd., is having plans prepared for the construction of a 1 and 4 story automobile assembly plant. Estimated cost $500,000. Hutton & Soutar, Hamilton, Archts.

Que., Arnqui—I. B. R. Levesque Ltd, plans the construction of a general machinery plant. Estimated cost $40,000.